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To Study The Effect Of Aerobic Exercise Versus Macqueen's Progressive Resisted Exercises Versus Patients On Medications Along With Conventional Exercises On Blood Pressure And Triglycerides Values In Subjects With Hypertension- A Comparative Study

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ABSTRACT

Background:

As per the World Health Organization, hypertension is characterized by a minimum diastolic blood pressure of 90 mmHg (12.0 KPa) and a minimum systolic blood pressure of 140 mmHg (18.7 KPa). Added that 25.7% of women and 5% of men in India had hypertension, which was the country's overall prevalence of the condition at 30.7% of the year 2019. Exercises including aerobic and slow breathing are crucial for reducing blood pressure and improving exercise tolerance. Progressive resistive exercise is a non-pharmacological method that can help lower systolic and diastolic blood pressure as part of a healthy lifestyle, even for hypertensive persons.

Methodology:

Patients with essential hypertension (n=123) were included in this study. They were divided into 3groups,41 for each group, aerobic exercises along with breathing exercise, macqueen resisted exercises along with breathing exercise, breathing exercise along with medications was given respectively for 4 weeks,4 day a week. Pre and post values were noted.

Result:

There was significant improvement in lowering blood pressure and reducing triglycerides values in all 3 groups individually with p value < 0.001. There was more effect size for Group B than Group A and Group C comparatively.

Conclusion:

It is concluded that Group B i.e Macqueen's Progressive Resisted Exercise helps in lowering blood pressure and decreasing triglyceride value in blood than Group A i.e Aerobic exercise(jumping, jogging stepup and stepdown) and Group C i.e breathing exercises

Keywords:

SYSTOLIC BLOOD PRESSURE, (SBP), DIASTOLIC BLOOD PRESSURE (DBP),BLOOD PRESSURE(BP), WORLD HEALTH ORGANISATION(WHO),HYPERTENSION(HTN),HIGH DENSITY LIPOPROTEIN (HDL)LOW DENSITY LIPOPROTEIN ,(LDL)

INTRODUCTION

• The World Health Organization defines hypertension as having a systolic blood pressure of at least 140 mmHg (18.7 KPa) and a diastolic blood pressure of at least 90 mmHg (12.0 KPa).[1] further stated that the prevalence of hypertension in year 2019 in India was 30.7% overall, with 5% of men and 25.7% of women affected.[2]

- Classification of hypertension by blood pressure level
- **Table:1 Classification of hypertension by blood pressure level by WHO criteria.**

	Systolic and Diastolic pressure.(SBP and DBP)	mmHg(Kpa)
Normotension	<140(<18.7)SBP and	<90(12.0)DBP
Mild hypertension Subgroup-borderline	140-180(18.7-24.0)SBP or 140-160 (18.7-21.3) SBP or	90-105 (12.0-14.0) DBP 90-95 (12.0-12.7) DBP
Moderate and severe hypertension^a	>180(>24.0) SBP	>105(>14.0) DBP
Isolated systolic hypertension	>140(18.7) SBP and	<90(<12.0) DBP
Subgroup-borderline	140-160 (18.7-21.3) SBP and	<90(<12.0) DBP

• Studies have identified age, sex, smoking, obesity, sedentary behavior, diabetes, renal disease, genetic, inherited, dietary, and environmental risk factors in individuals with established high blood pressure.[3]

• Essential Hypertension "have discussed the alterations that result in the development of elevated afterload and total peripheral resistance, which in turn results in the development of hypertension." The renin-angiotensin-aldosterone system (RAAS) response is compromised, there is an increase in sympathetic nervous system activation, and there is enhanced volume expansion due to increased salt absorption. [4]

• Treatment with antihypertensive medications has changed the course of hypertension naturally. On the other hand, the main issues with managed hypertension now include coronary artery disease, retinopathy, renal failure, myocardial infraction, thrombotic stroke, and congestive heart failure. [5]

• The high concentrations of cholesterol and triglycerides cause a significant transition between the lipids in the plasma membrane and those in the blood, which alters ion transport and causes the membrane to become less fluid.

- A higher cholesterol supply to the plasma membrane is linked to a lower sodium outflow and a decreased function of the potassium and sodium pumps.

• This raises blood pressure and increases the amount of sugar, trans fat, and saturated fat that are consumed. This raises cholesterol levels, which are linked to diets high in sodium. This, in turn, accentuates the rise in blood pressure and increases the risk of developing hypertension.[6]

• For those who have high blood pressure, aerobic exercise lowers blood pressure. It will lessen adrenaline, which will inhibit sympathetic nervous system activity. Moreover, it will lower the level of angiotensin II in the blood, which lowers peripheral vascular resistance and raises baroreceptor sensitivity.

• Aerobic and slow-breathing workouts are important in lowering blood pressure and enhancing exercise tolerance. [Hallbert, JA. 1997]

• Slow breathing training is a type of breathing exercise in which the respiratory amplitude is increased and the respiratory rate is decreased seven to eight times per minute. [3]Exercises involving slow breathing promote

respiratory and cardiovascular health by reducing sympathetic activity. As a result, it will lower a person's heart rate, systolic, and diastolic blood pressure who has hypertension. Slow controlled breathing exercises are those that are regulated at a rate of seven to eight cycles per minute.

• Although weight training has been shown to help manage hypertension, earlier research suggested that it may raise the incidence of blood pressure.[7]

• Even hypertensive individuals can benefit from progressive resistive exercise as a non-pharmacological strategy for lowering systolic and diastolic blood pressure as part of a healthy lifestyle.

- Cardiopulmonary physiotherapy, which uses slow breathing and progressive resistive activities to lower blood pressure, may be very important in treating hypertension. It is a drug-free method of treating hypertension that will benefit all types of people, but it especially aids the impoverished in managing their condition.

NEED FOR STUDY

- The blood pressure in most of hypertensive patients still remains elevated despite of medications due to ageing, overweight, insulin resistance, high alcohol intake, high salt intake, a sedentary lifestyle, stress, low sodium, potassium intake, cigarette smoking.
- Previous studies state that Aerobic exercises along with conventional physiotherapy significantly decreases the systolic and diastolic hypertension.
- Previous studies states that Macqueen's progressive resistance training along with conventional physiotherapy significantly decreases the both systolic and diastolic hypertension.
- Currently, there is no study done to compare the effect of aerobic exercises verses Macqueen's progressive resisted exercises verses patients on medication along with conventional physiotherapy on blood pressure and triglycerides value in subjects with hypertension.
- So, need to conduct the study is to find out effectiveness of aerobic exercises versus Macqueen's progressive resisted exercises versus patient with medication along with conventional physiotherapy on blood pressure and triglycerides value in subjects with hypertension.

AIM AND OBJECTIVES

AIM:

To study the effect of Aerobic exercises versus Macqueen's progressive resisted exercises versus patient with medication along with conventional physiotherapy on blood pressure and triglycerides value in subjects with Hypertension.

OBJECTIVES:

- To find out the effect of aerobic exercises along with conventional physiotherapy on the blood pressure value in subjects with hypertensive patients on medications.
- To find out the effect of aerobic exercises along with conventional physiotherapy on the triglycerides value in subjects with hypertensive patients on medications.
- To find out the effect of Macqueen's progressive resisted exercise along with conventional physiotherapy on the blood pressure value in subjects with hypertensive.
- To find out the effect of Macqueen's progressive resisted exercise along with conventional physiotherapy on the triglycerides value in subjects with hypertensive.
- To find out the effect of conventional physiotherapy on the blood pressure value in subjects with hypertensive patients on medications.
- To find out the effect of conventional physiotherapy on the triglycerides value in subjects with hypertensive patients on medications.
- To compare the effectiveness of aerobic exercises versus Macqueen's progressive resisted exercise versus patients on medications along with conventional physiotherapy on blood pressure and triglycerides value in subjects with hypertension.

HYPOTHESIS

- **NULL HYPOTHESIS**

  There will be no effect of Aerobic exercises versus Macqueen's progressive resisted exercise versus patients on medications along with conventional physiotherapy on blood pressure and triglycerides value in subjects with hypertension.

- **ALTERNATIVE HYPOTHESIS**

There will be significant effect of Aerobic exercises versus Macqueen's progressive resisted exercise versus patients on medications along with conventional physiotherapy on blood pressure and triglycerides value in subjects with hypertension.

REVIEW OF LITERATURE

1. Ms. C. Manoranjitham (2016)

The purpose of the study is to find out the effect of slow breathing training along with conventional physiotherapy in cardio respiratory control in patients with essential hypertension. 40 patients with the age group of 45-55 years were randomly selected for the study Group A underwent slow breathing training along with aerobic exercises. Group B underwent aerobic exercises alone. So, Analysis of the study concludes that slow breathing exercises along with conventional physiotherapy is the most beneficial effective than the aerobic exercises alone in patients with essential hypertension.

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2. Lokesh R, S G Sudhan. (2017)

Abstract- Many studies suggest that resisted training program can be a part of healthy life style for hypertensives, slow and controlled breathing exercises also significantly decreases the blood pressure. These techniques help the hypertensive peoples to live drug free life for hypertension.The systolic and diastolic values of pre and post exercise sessions of both were statistically analyzed. Results did not show significant results between both groups. Conclusion-This study findings shows that results of group with Macqueen's technique of progressive resisted exercise along with breathing control training significantly reduces the blood pressure.

3. Sivasubramanian Ramakrishnan et.al (2019)

In this article it states that prevalence is reported a hypertension prevalence of 5% in men and 25.7% among women and overall was 30.7% in india.Conclusion: there is a very high prevalence of hypertension among Indian adults ,across all age groups. In addition there is poor awareness, treatment and control among those with hypertension

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4. Hung ju le et.al (2020)

This study states that, A total of 7 BP estimation protocols were assessed according to the latest American College of Cardiology (ACC), Chinese Hypertension League (CHL), European Society of Cardiology (ESC), 81 041 participants, 62 647 adults with 3 BP readings were included. The median(interquartile range) age was 59.0 (46.0-69.0) years, and 31 922 (51.5%) were women. The intraindividual maximum mean (SD) differences in systolic/diastolic BP estimates among the seven protocols were 4.8 (4.3)/3.3 (3.1) mm Hg.

5. Kamrun Nahar Choudhury1 et.al

This study states that, all tests were carried out at the laboratory of the NCCRF&HD in Dhaka, Bangladesh. Lipid parameters (TC, TG, LDL, and HDL) were estimated by enzymatic colorimetric methods. The study included 234 participants with a mean age ± SD of 44.7±5.7 years and BMI of 25.2±3.8 kg/m2. The mean SBP and DBP were 137.9±9.6 mmHg and 94.4±8.8 mmHg, respectively. The mean BMI, TC, HDL, and

LDL were higher for males compared to females, which was statistically significant (*P*,0.05). The mean WC was higher in males, which was not statistically significant.

6. Arthur de sa Ferreira et.al

The main objective of this work is to evaluate the quadriceps strength and fatigue tolerance after a program of resistance exercise in subjects with resistant primary hypertension. The prescribed protocol seemed to successfully increase localized muscle strength without negatively affecting the monitored cardiovascular variables in patients with resistant hypertension under pharmacological treatment.

7.Rubens Moura Campas Zeron et.al

This study states that there is elevation in the plasmalemma that occurs in high pressure carrier shows changes in lipid composition. Conclusion-This study states that there is corelation between hypertension and triglycerides.

8. Seals DR , Hagberg JM et .al

They conducted a study on numerous sources of information in both the medical and exercise physiology areas state that exercise training lowers blood pressure at rest and during submaximal exercise in normotensive and hypertensive individuals. Based on these statements, the medical community is currently recommending regular exercise as a non-pharmacological therapy for reducing blood pressure in hypertensive patients. The purpose of this review was to assess the existing literature in this area to determine whether a basis exists for this recommendation. Our findings indicate that most of the studies reviewed reported modest reductions in blood pressure (means less than or equal to 10 mmHg) at rest and during submaximal exercise after training. However, even the modest reductions in blood pressure reported in these studies must be interpreted with caution because of numerous methodological shortcomings and inadequate study design, most notably the omission of non-exercising hypertensive control groups. Therefore, the evidence available at the present time is inadequate to recommend exercise training as a non-pharmacological therapy in hypertension.

9. George A. Kelley et al.

The aim of this study was to use the meta-analytic approach to examine the effects of aerobic exercise on resting systolic and diastolic blood pressure among adult women. Studies were retrieved from computer searches (MEDLINE, Sport Discus, Current Contents) and bibliographies of retrieved articles were cross-referenced. Inclusion criteria were as follows: (1) randomized trials, (2) aerobic activity as the primary exercise intervention, (3) comparative non exercise control group included, (4) changes in resting systolic and/or diastolic blood pressure assessed for women ages 18 and older, and (5) studies published in English-language journals between January 1966 and January 1998. The primary outcomes retrieved in this study were changes in resting systolic and diastolic blood pressure calculated as the difference (exercise minus control) of the changes (initial minus final) in these mean values. Ten studies representing 732 subjects and 36 primary outcomes (19 systolic, 17 diastolic) met the criteria for inclusion. Overall, an approximate 2% decrease in resting systolic and 1% decrease in resting diastolic blood pressure were observed (systolic, $x\pm$ SD = -2 ± 2.6 mm Hg, 95% bootstrap confidence interval −3 to −1 mm Hg; diastolic, $x\pm$ SD = -1 ± 1.9 mm Hg, 95% bootstrap confidence interval −2 to −1 mm Hg).Aerobic exercise results in small reductions in resting systolic and diastolic blood pressure among adult women. However, a need exists for additional, well-designed studies on this topic, especially among hypertensive adult women.

10. James M. Hagberg, Jung-Jun Park & Michael D. Brown et.al

They conducted a study on Hypertension is a very prevalent cardiovascular (CV) disease risk factor in developed countries. All current treatment guidelines emphasise the role of nonpharmacological interventions, including physical activity, in the treatment of hypertension. Since our most recent review of the effects of exercise training on patients with hypertension, 15 studies have been published in the English literature. These results continue to indicate that exercise training decreases blood pressure (BP) in approximately 75% of individuals with hypertension, with systolic and diastolic BP reductions averaging approximately 11 and 8mm Hg, respectively. Women may reduce BP more with exercise training than men, and middle-aged people with hypertension may obtain greater benefits than young or older people. Low to moderate intensity training appears to be as, if not more, beneficial as higher intensity training for reducing BP in individuals with hypertension. BP reductions are rapidly evident although, at least for systolic BP, there is a tendency for greater reductions with more prolonged training. However, sustained BP reductions are evident during the 24 hours following a single bout of exercise in patients with hypertension.

11. D E Anderson, J D McNeely & B G Windham et.al

They conducted a study about , Previous studies reported that a device-guided slow-breathing (DGB) exercise decreases resting blood pressure (BP) in hypertensive patients. This study investigated the effects of daily practice of DGB on (a) 24-h BP and breathing patterns in the natural environment, as well as (b) BP and breathing pattern during clinic rest. Altogether, 40 participants with pre-hypertension or stage 1 hypertension were trained to decrease breathing rate through DGB or to passively attend to breathing (control, CTL) during daily 15-min sessions. The participants practiced their breathing exercise at home for 4 weeks. The DGB (but not the CTL) intervention decreased clinic resting BP, mid-day ambulatory systolic BP (in women only) and resting breathing rate, and increased resting tidal volume. However, 24-h BP level was not changed by DGB or CTL interventions, nor was overnight breathing pattern. These findings are consistent with the conclusion that a short-term, autonomic mechanism mediated the observed changes in resting BP, but provided no evidence that regular DGB affected factors involved in long-term BP regulation. Additional research will be needed to determine whether 24-h BP can be lowered by a more prolonged intervention.

12. Rajeev Gupta , Denis Xavier et.al

They conducted study on non-communicable diseases are important causes of mortality and morbidity in India. Data from the Registrar General of India, World Health Organization and Global Burden of Disease (GBD) Study have reported that cardiovascular diseases (CVD) are the most important causes of death and disability. Age-adjusted mortality from these conditions has increased by 31% in last 25 years. Case-control studies have reported that hypertension is most important risk factor for CVD in India. GBD Study has estimated that hypertension led to 1.6 million deaths and 33.9 million disability-adjusted life years in 2015 and is most important cause of disease burden in India. Intensive public health effort is required to increase its awareness, treatment and control. UN Sustainable Development Goals highlight the importance of high rates of hypertension control for achieving target of 1/3 reduction in non-communicable disease mortality by 2030. It is estimated that better hypertension control can prevent 400–500,000 premature deaths in India.

13. Anchala, Raghupathy[a,b]; Kannuri, Nanda K.[b]; Pant, Hira[b]; Khan, Hassan[a]; Franco, Oscar H.[c]; Di Angelantonio, Emanuele[a]; Prabhakaran, Dorairaj et.al

They conducted a study on a region-specific (urban and rural parts of north, east, west, and south India) systematic review and meta-analysis of the prevalence, awareness, and control of hypertension among Indian patients have not been done before. *Medline, Web of Science, and Scopus* databases from 1950 to 30 April 2013 were searched for ‘prevalence, burden, awareness, and control of blood pressure (BP) or hypertension

(≥140 SBP and or ≥90 DBP) among Indian adults' (≥18 years). Of the total 3047 articles, 142 were included. Overall prevalence for hypertension in India was 29.8% (95% confidence interval: 26.7–33.0). Significant differences in hypertension prevalence were noted between rural and urban parts [27.6% (23.2–32.0) and 33.8% (29.7–37.8); *P* = 0.05]. Regional estimates for the prevalence of hypertension were as follows: 14.5% (13.3–15.7), 31.7% (30.2–33.3), 18.1% (16.9–19.2), and 21.1% (20.1–22.0) for rural north, east, west, and south India; and 28.8% (26.9–30.8), 34.5% (32.6–36.5), 35.8% (35.2–36.5), and 31.8% (30.4–33.1) for urban north, east, west, and south India, respectively. Overall estimates for the prevalence of awareness, treatment, and control of BP were 25.3% (21.4–29.3), 25.1% (17.0–33.1), and 10.7% (6.5–15.0) for rural Indians; and 42.0% (35.2–48.9), 37.6% (24.0–51.2), and 20.2% (11.6–28.7) for urban Indians. About 33% urban and 25% rural Indians are hypertensive. Of these, 25% rural and 42% urban Indians are aware of their hypertensive status. Only 25% rural and 38% of urban Indians are being treated for hypertension. One-tenth of rural and one-fifth of urban Indian hypertensive population have their BP under control.

14. Arthur de Sá Ferreira Juliana Flávia de Oliveira ,Ivan Cordovil José Barbosa Filho et.al

They did a study on Resistant arterial hypertension may lead to muscle disuse and reduced functional capacity due to arterial and target-organs lesions. The main objective of this work is to evaluate the quadriceps strength and fatigue tolerance after a program of resistance exercise in subjects with resistant primary hypertension. Six patients under pharmacological treatment were submitted to a four-week resistance exercise training program for the quadriceps (8-14 repetitions, 3 sets, 3 days per week). Strength was evaluated by isometric dynamometry, as the percentage change in maximum voluntary contraction over the four week program. Fatigue was analyzed by surface electromyography, as the change in both root mean square value and intercept of median frequency slope of vastus medialis and vastus lateralis. Significant increase in the maximum voluntary contraction was observed ($p = 0.04$). Fatigue tolerance was not improved as seen by root mean square as well as in the intercept of median frequency($p > 0.05$). Additionally, no significant changes were observed in resting arterial blood pressure and heartrate throughout the training period. The prescribed protocol seemed to successfully increase localized muscle strength without negatively affecting the monitored cardiovascular variables in patients with resistant hypertension under pharmacological treatment.

15. Anna F. Dominiczak, Anne 0. Davidson, et al

Over the past decade the possibility of membrane abnormalities in hypertension has been studied very extensively. These studies reflect the putative significance of membrane abnormalities in the pathogenesis of this disease, and the need for resolution of the great divergence of the results that have been reported. Nevertheless, two sound generalizations have emerged from studies of the plasma membrane in hypertension: 1) The micro viscosity of the plasma membrane is elevated (fluidity is decreased). However, genetic studies have cast doubt on the possibility that the decreased fluidity of the plasma membrane plays a role in the cause of experimental hypertension. 2) The stabilizing influence of calcium is diminished. The roles, if any, of these two abnormalities in the pathogenesis of hypertension require further study. Specific abnormalities, such as that of the Na/Li counter transport or Na/H exchange activity, may be useful phenotypic markers of subgroups of patients with essential hypertension.

16. Lijnen, Paul; Celis, Hilde; et al

They did a study In order to determine whether alterations in membrane lipids affect transmembrane cationic transport systems in erythrocytes and platelets, cationic fluxes and intracellular cationic concentrations were measured in hypercholesterolaemic patients before and during administration of an inhibitor of 3-hydroxy-3-

methylglutaryl coenzyme A reductase.After a 1-month run-in placebo period on a lipid-lowering diet the patients were treated, in a double-blind manner, with either placebo (n=25) or pravastatin (n=25) for 6 months. Placebo or pravastatin (10 mg during the first month, 20 mg during the second month and 40 mg during the remaining 4 months) was administered once a day in the evening.Compared with the placebo group, the erythrocyte and platelet membrane cholesterol content was reduced in the patients treated with pravastatin. The intra-erythrocyte and intraplatelet Na^+ concentration was reduced during pravastatin administration, whereas the activity of the erythrocyte and platelet Na^+-K^+ pump was increased. However, the intra-erythrocyte and intraplatelet K^+, Mg^{2+} and cytosolic Ca^{2+} concentrations, and water content, as well as the activities of the erythrocyte Na^+-Li^+ countertransporter and Na^+, K^+ cotransporter, and Na+ and K+ leakage, were not changed during pravastatin treatment.The present data show that cholesterol lowering in hypercholesterolaemic patients may result in a significant decrease in erythrocyte and platelet membrane cholesterol content. These changes in membrane cholesterol are accompanied by an increase in activity of the Na^+-K^+ pump and a decrease in intra-erythrocyte and intraplatelet Na^* concentrations.

17. Feng Wang MM [a], Lili Han MM

Studies on the association of fasting insulin concentrations or insulin resistance with subsequent risk of hypertension have yielded conflicting results.To quantitatively assess the association of fasting insulin concentrations or homeostasis model assessment insulin resistance (HOMA-IR) with incident hypertension in a general population by performing a meta-analysis. We searched the PubMed and Embase databases until August 31, 2016 for prospective observational studies investigating the elevated fasting insulin concentrations or HOMA-IR with subsequent risk of hypertension in the general population. Pooled risk ratio (RR) and 95% confidence interval (CI) of hypertension was calculated for the highest versus the lowest category of fasting insulin or HOMA-IR.Eleven studies involving 10,230 hypertension cases were identified from 55,059 participants. Meta-analysis showed that the pooled adjusted RR of hypertension was 1.54 (95% CI 1.34–1.76) for fasting insulin concentrations and 1.43 (95% CI 1.27–1.62) for HOMA-IR comparing the highest to the lowest category. Subgroup analysis results showed that the association of fasting insulin concentrations with subsequent risk of hypertension seemed more pronounced in women (RR 2.07; 95% CI 1.19–3.60) than in men (RR 1.48; 95% CI 1.17–1.88 This meta-analysis suggests that elevated fasting insulin concentrations or insulin resistance as estimated by homeostasis model assessment is independently associated with an exacerbated risk of hypertension in the general population. Early intervention of hyperinsulinemia or insulin resistance may help clinicians to identify the high risk of hypertensive population.

18. Sánchez-Íñigo, Laura; Navarro-González, et al

Triglycerides and high-density lipoprotein cholesterol (HDL-C) are known to be risk factors for cardiovascular disease. However, there has been limited knowledge on the relationship between triglycerides and incident hypertension. The associations of incident hypertension with triglycerides and triglycerides-related indices such as triglycerides to HDL-C ratio (TG/HDL-C) and triglyceride–glucose index (TyG) were evaluated. Data from 3637 participants from the Vascular Metabolic Clinica Universidad Navarra cohort were followed-up during a mean of 8.49 years. A Cox proportional hazard ratio with repeated measures analyses was performed to assess the risk of developing hypertension across the quintiles of triglycerides, TG/HDL-C ratio, and TyG index.The risk of developing hypertension was 47% and 73% greater for those in the fourth and fifth quintiles of triglycerides, after adjusting for age, sex, BMI, cigarette smoking, daily alcohol intake, lifestyle pattern, type 2 diabetes, antiaggregation therapy, low-density lipoprotein cholesterol, SBP, and DBP. In men, those in

the top quintile of triglycerides, TG/HDL-C ratio or TyG index were two times more likely to develop hypertension than those in the bottom quintile. In women, the effect was attenuated although the risk of hypertension rose with increasing quintiles (*P* for trend <0.05). The results were consistent when analyses were restricted to those participants without diabetes and obesity at baseline. Our results evidenced the associations between triglycerides-related variables and incident hypertension independently of adiposity. This association was stronger than those observed for other commonly used lipid parameters or lipid ratios, such as the TC/HDL-C ratio.

19. Noelina Hernández Sonia H. Torres et al.

Arterial hypertension produces changes along the vascular tree. How-ever, there are few reports on its effect on human muscle capillaries. This study demonstrates the effects of essential hypertension on the capillaries of human quadriceps muscle. Muscle biopsy was taken from quadriceps femoris in eight men with recent diagnosis of essential hypertension, without treatment. Biopsies were also taken from eight normotensive men and were used as controls. Fiber types were classified by ATPase reaction, capillaries counted ina-amylase-PAS stained sections and ultrastructure studied by conventional methods of transmission electron microscopy. No changes were found in capillaries or muscle fiber types by histochemi-cal methods. However, electron microscopy revealed abnormal capillaries with endothelial cells infoldings into the lumen, as well as occluded or degenerated capillaries. In some cases the endothelial cell area covered by pericytes was increased. Basement membrane of capillaries was frequently increased in width, sometimes irregularly, and in other instances it was reduplicated. In transversely sectioned capillaries lumen diameter was reduced and wall thickness was increased, although total diameter was unchanged. In hypertensive patients the finding of some degenerated capillaries adjacent to muscle fibers could be interpreted as the beginning of a process of rarefaction. Some capillaries showed morphological changes, and the ratio wall thickness/lumen was increased. Anat Rec 256:425–432, 1999.r1999 Wiley-Liss, Inc.

20. NOELINA HERNA´NDEZ,1*SONIA H. TORRES et al

Arterial hypertension produces changes along the vascular tree. How-ever, there are few reports on its effect on human muscle capillaries. Thisstudy demonstrates the effects of essential hypertension on the capillaries ofhumanquadricepsmuscle.Muscle biopsy was taken fromquadriceps femorisin eight men with recent diagnosis of essential hypertension, without treatment. Biopsieswere also taken from eight normotensive men and were used as controls.Fiber types were classified by ATPase reaction, capillaries counted ina-amylase-PAS stained sections and ultrastructure studied by conventionalmethods of transmission electron microscopy.No changes were found in capillaries or muscle fiber types by histochemi-cal methods. However, electron microscopy revealed abnormal capillarieswith endothelial cells infoldings into the lumen, as well as occluded ordegenerated capillaries. In some cases the endothelial cell area covered bypericytes was increased. Basement membrane of capillaries was frequentlyincreased in width, sometimes irregularly, and

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MATERIALS

- Sphygmomanometer
- Stethoscope
- Stepper
- Chair
- Dumbells –weight types-1Kg,2Kg,3Kg,4Kg, etc.
- Weight cuffs

FIGURE:1

FIGURE:2

FIGURE:3

FIGURE4

FIGURE:5

METHODOLOGY

- Types of study: Comparative study.
- Study design: Randomised control trial.
- Study duration: 6 months.
- Types of sampling: Purposive sampling.
- Sample size: 123
- Study setting: Wanless hospital (OPD), MIRAJ

INCLUSION AND EXCLUSION CRITERIA

INCLUSIVE CRITERIA

- Age group: 30-50 years.
- Both Male and Female.
- Patient with Hypertension (bp above 150/100mmHg) diagnosed by physician with medication.
- Patients willing to participate.

EXCLUSION CRITERIA

- Patient with any recent injury or fracture.
- Cardiorespiratory and Cardiovascular complications.
- Patient associated with any other co-morbidity.
- Patient associated with physical activities
- Female associated with ANC and PNC
- Patients with neurological complications.

OUTCOME MEASURES

- Blood pressure [8]

TABLE:2 CLASSIFICATION OF SYSTOLIC AND DIASTOLIC BLOOD PRESSURE

CLASSIFICATION	SYSTOLIC	DIASTOLIC
Normal	**<120mmHg**	**<80mmHg**
Elevated	<120-129mmHg	<80mmHg
High	≥130mmHg	≤80mmHg

Reliability and validity of sphygmomanometer:[9]

1. Test-retest ($0.83 \leq ICC \leq 0.97$; $p < 0.0001$)
2. Inter-rated reliabilities ($0.79 \leq ICC \leq 0.97$; $p < 0.0001$)
3. Validity ($0.61 \leq r \leq 0.95$; $p < 0.0001$)

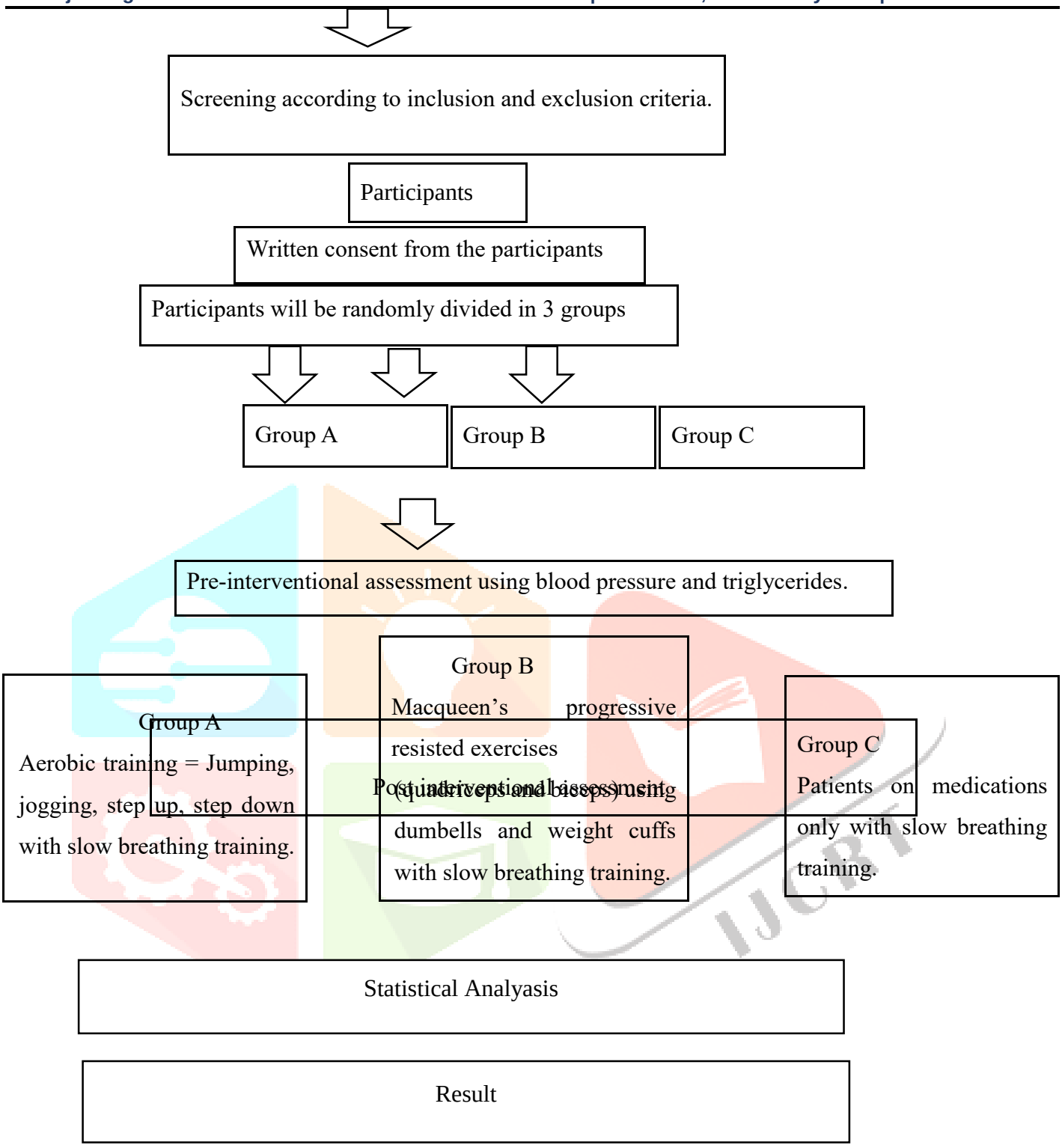
- Triglycerides-[10]

  Normal values

  1) Serum cholesterol-150-200mg/dl
  2) Serum Triglycerides- 60-160mg/dl
  3) Serum HDL Cholesterol-35-55mg/dl
  4) Serum LDL Cholesterol- <100mg/dl

PROCEDURE

Ethical Committee Clearance



GROUP A [Experimental group]

Were treated with Aerobic exercises along with conventional physiotherapy. First patients were performed with aerobics exercises. After the half an hour of rest period they treated with slow breathing training.

Aerobic exercises training

Warm up period to prepare the body for work out which includes active stretching for 5 minutes. Exercises performed for 20 minutes of aerobic exercises which includes jumping, step up step down and jogging

exercises with moderate intensity. Cool down period for 5 minutes for bring heart rate down and increase flexibility.

Also check the pre-post blood pressure of patient during intervention.

According to the FITT principle-

F-frequency- 5 times/week. For 4 weeks.

I-Intensity- Moderate

T-Time- 30 minutes

T-Type- aerobic exercises

(Jumping, Jogging, Step up step down)

the program includes:

A. warm-up for 5 minutes of active stretching,
B. Jumping, Jogging, step up step down=20minutes with moderate intensity
C. Cool-down- for 5 minutes – for 5 times/week for 4 week.

Take the pre and post vitals.

FIGURE5:JOGGING

FIGURE6: JUMPING

FIGURE7: STEP UP AND STEP DOWN

- **Slow Breathing Training**

Patients were positioned in high sitting position in a relaxed and comfortable manner. Performed slow breathing exercises at six cycles per minute, followed by two minutes rest for ten minutes. Place the both hands over the abdomen and ask them inhale deeply through nose exhale slowly through mouth. They should feel the movement of the diaphragm. Breathing was controlled by visual instruction and continuous of monitoring breathing rate. Instructions were given to repeat the same breathing exercises 4 times daily for one successful week

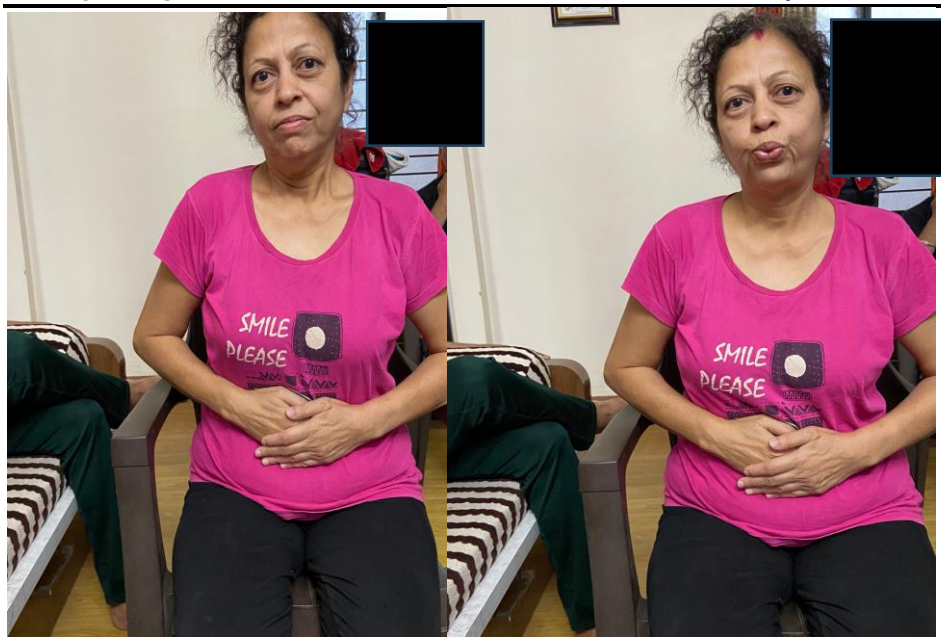


FIGURE8: POSITION OF SLOW BREATHING EXERCISE DURING INHALE.

POSITION OF SLOW BREATHING EXERCISE DURING EXHALE.

GROUP B [Experimental group]

Were treated with Macqueen's progressive resisted exercise and Conventional physiotherapy First, patients were performed with Macqueen's progressive resisted exercise. After the half an hour of rest period they treated with Slow breathing exercise.

MACQUEEN'S PROGRESSIVE RESISTED EXERCISE

- Patients were positioned in sitting position in a relaxed and comfortable manner. Performed Macqueen protocol of progressive resisted exercise (quadriceps and biceps) by using dumbbells and weight cuff of varying loads, 4 times a week for 4 week duration.
- Length of exercise in the study is 4 week duration, frequency 4 times a week
- Training session consists of 3 sets of no. of repetition along 4 weeks accordingly (8-10-12-14 repetition for week 1-2-3-4) according to 10 RM DELORME regime at ankle-weight for knee extensors bilaterally.
- Rest period is 30 seconds.
- Also check the pre-post blood pressure of patient during intervention.
- For biceps, biceps curl is performed by the dumbbell.
- For quadriceps strengthening is performed with weight cuff
- According to the Delorme regimen
- 10 reps @ 50% of the 10 RM

- 10 reps @ 75% of the 10 RM

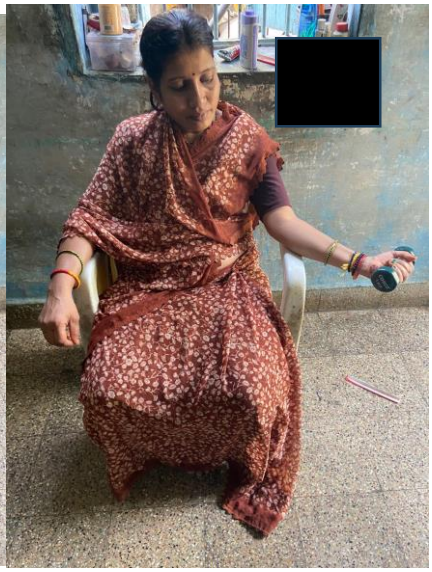








FIGURE 9: BICEP CURLS

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FIGURE 10:QUADRICEPS STRENGHTENING

FIGURE11: BREATHING EXERCISE

Group C [Control Group]

- Slow breathing exercises.
- Check for the pre and post blood pressure

Breathing exercise:

Patient is asked to sit on chair and ask to relax. Patient is then instructed to slowly breath in by nose and exhale through mouth.This exercise is repeated for 10 times.

FIGURE 12 : BREATHING EXERCISE

STASISTICAL ANALYSIS

- Statistical analysis will be done using t test and Wilcoxon test.

Wilcoxon Test:

$$z = \frac{W - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}$$

In which: z = de z-value of the standard normal distribution
W = de calculated W-value
n = het number of elements in the analysis

T-paired test:

$$t = \frac{\Sigma d}{\sqrt{\frac{n\left(\Sigma d^2\right) - \left(\Sigma d\right)^2}{n-1}}}$$

RESULTS

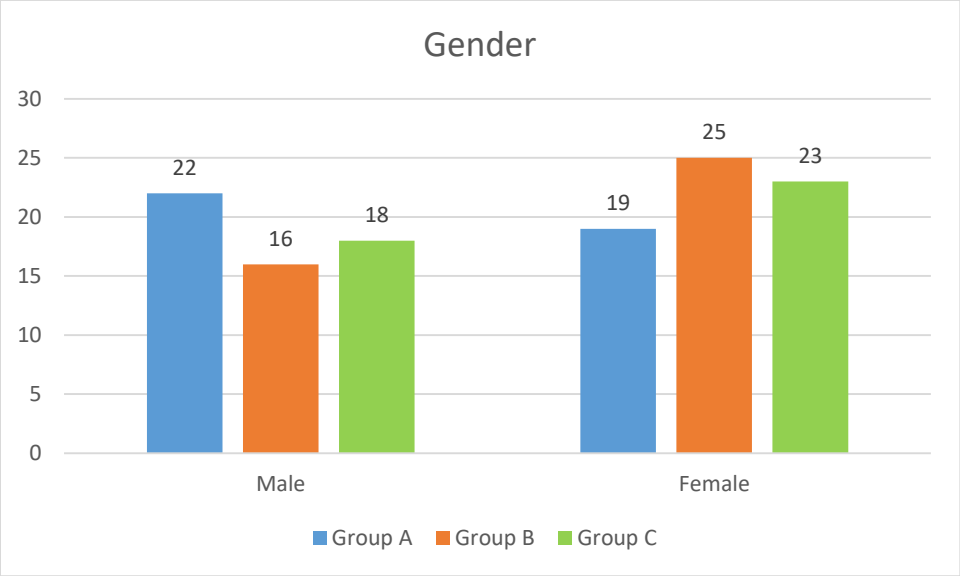
TABLE:3Test of Normality for the Groups of the study using Shapiro-Wilk

Variables	Time	Group A Aerobic		Group B Macqueens		Group C Medications	
		Z-value	p-value	Z-value	p-value	Z-value	p-value
BP 1	Pre	0.855	0.000	0.904	0.002	0.851	0.000
	Post	0.804	0.000	0.822	0.000	0.777	0.000
	Difference	0.883	0.001	0.776	0.000	0.894	0.001
BP 2	Pre	0.865	0.000	0.709	0.000	0.836	0.000
	Post	0.846	0.000	0.765	0.000	0.804	0.000
	Difference	0.910	0.003	0.867	0.000	0.875	0.000
Triglycerides	Pre	0.925	0.010	0.963	0.203	0.969	0.312
	Post	0.926	0.011	0.965	0.234	0.968	0.306
	Difference	0.664	0.000	0.870	0.000	0.784	0.000

Data set for all the variables are not normally distributed as all the variables have not indicated p-value greater than 0.05 in the observation for all three groups. The researcher shall use non-parametric tests for data analysis purpose in the following sections.

TABLE:4 Distribution of Gender in all three groups

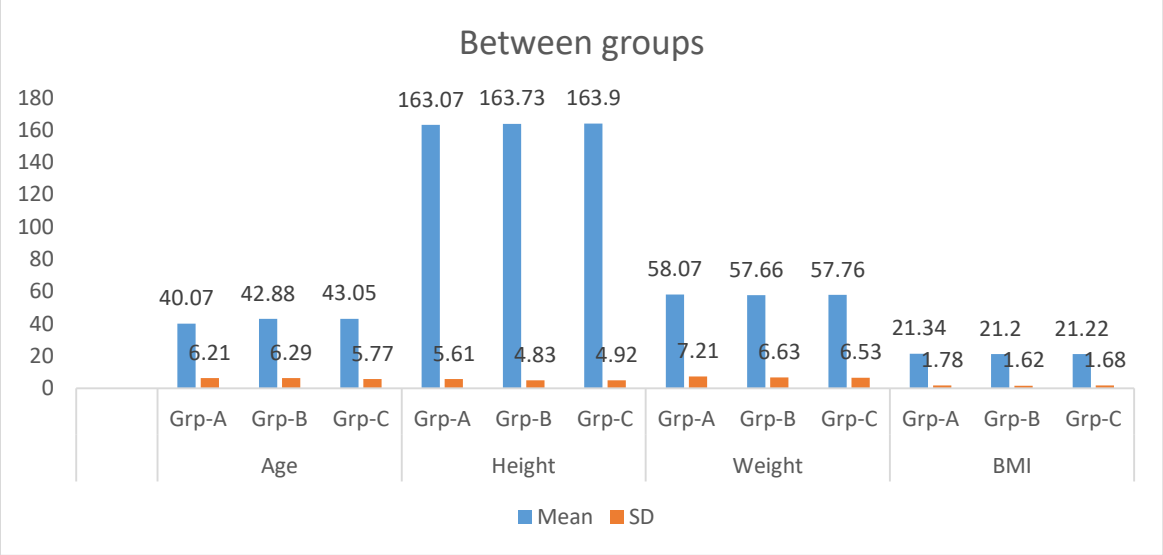
Particular		Group			Total	p-value
		Group A	Group B	Group C		
Gender	Male	22	16	18	56	0.399
	Female	19	25	23	67	
Total		41	41	41	123	



GRAPH:1 Distribution of Gender in all three groups

TABLE:5 Between groups Kruskall Wallis test

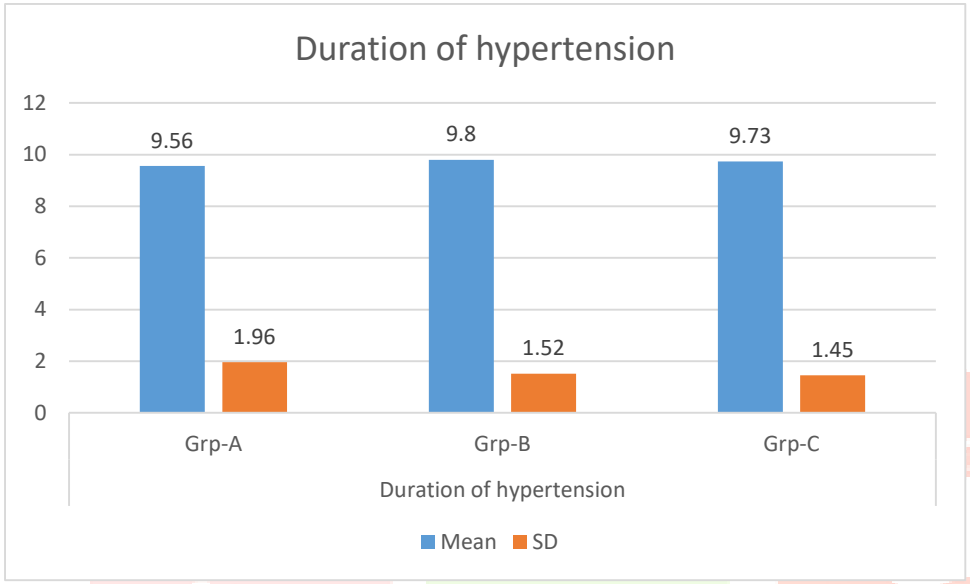
Variable	Group	Mean	SD	z-value	p-value
Age	Grp-A	40.07	6.21	6.526	0.038
	Grp-B	42.88	6.29		
	Grp-C	43.05	5.77		
	Total	42.00	6.20		
Height	Grp-A	163.07	5.61	0.708	0.702
	Grp-B	163.73	4.83		
	Grp-C	163.90	4.92		
	Total	163.57	5.11		
Weight	Grp-A	58.07	7.21	0.011	0.995
	Grp-B	57.66	6.63		
	Grp-C	57.76	6.53		
	Total	57.83	6.74		
BMI	Grp-A	21.34	1.78	0.342	0.843
	Grp-B	21.20	1.62		
	Grp-C	21.22	1.68		
	Total	21.25	1.68		



GRAPH:2 Between groups Kruskall Wallis test

TABLE:6 DURATION OF HYPERTENSION

Variable	Group	Mean	SD	z-value	p-value
Duration of hypertension	Grp-A	9.56	1.96	0.030	0.985
	Grp-B	9.80	1.52		
	Grp-C	9.73	1.45		
	Total	9.70	1.65		



GRAPH 3:DURATION OF HYPERTENSION

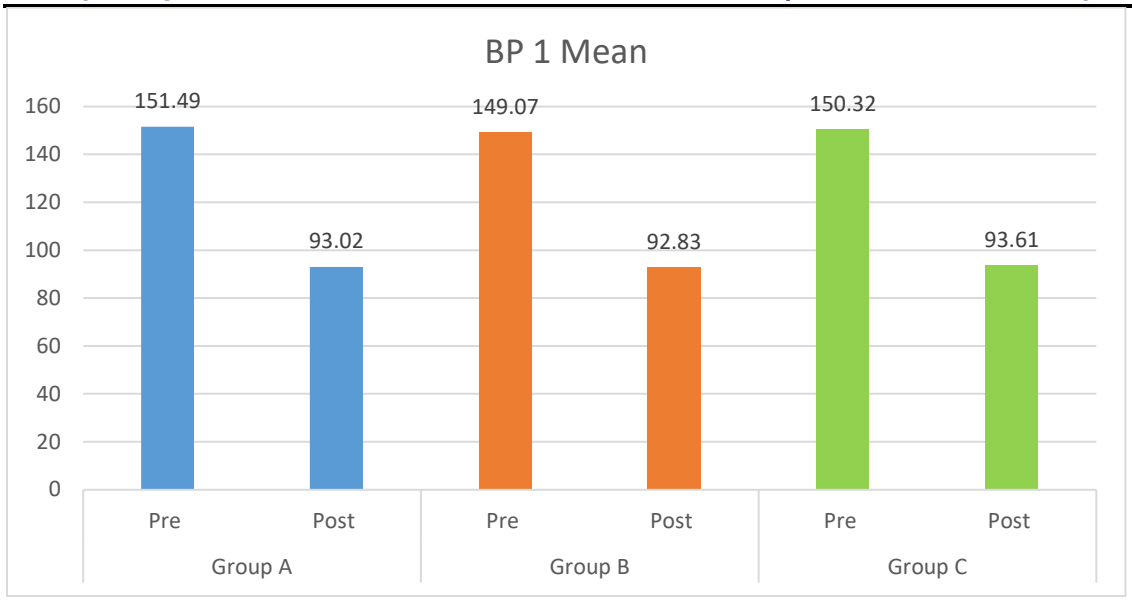
TABLE:7 WITHIN GROUP COMPARISON OF THREE STUDY GROUPS WITH RESPECT TO BP 1 USING PAIRED SAMPLE WILCOXON TEST

Groups	Times	Mean	SD	Mean Diff	SD Diff	Effect Size	z-value	p-value
Group A	Pre	151.49	7.12	58.46	5.62	10.41	5.618	0.001
	Post	93.02	6.42					
Group B	Pre	149.07	5.78	56.24	6.00	9.37	5.63	0.001
	Post	92.83	4.10					
Group C	Pre	150.32	7.08	56.71	5.48	10.34	5.613	0.001
	Post	93.61	6.59					

The mean value in group - A indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 10.41 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - B indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 9.37 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - C indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 10.34 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention



GRAPH:4 MEAN VALUE OF BP 1 IN GROUP A,B AND C

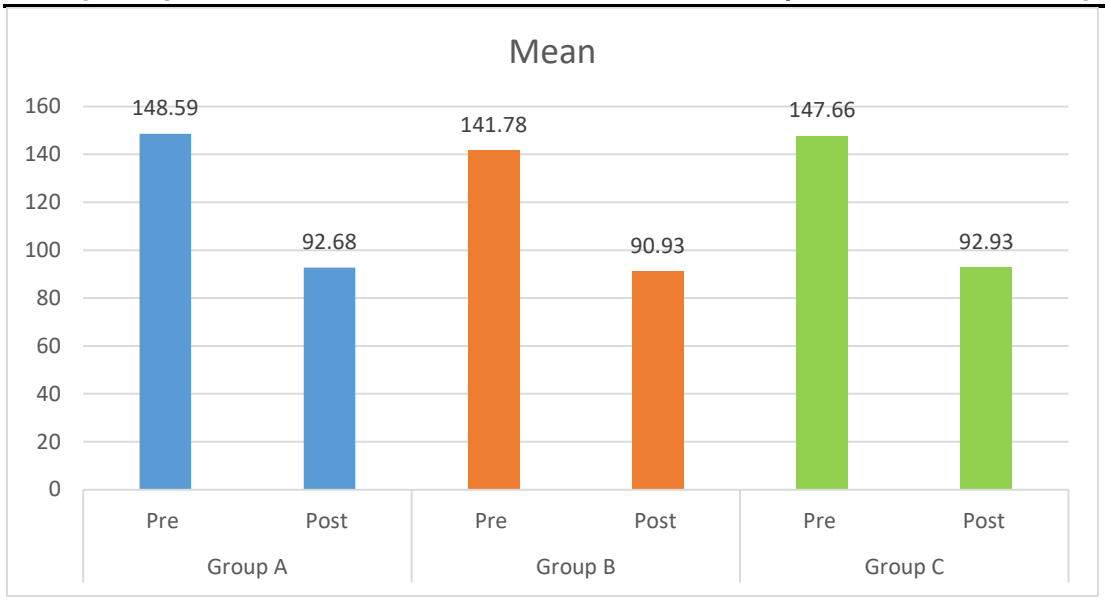
TABLE:8WITHIN GROUP COMPARISON OF THREE STUDY GROUPS WITH RESPECT TO BP 2 USING PAIRED SAMPLE WILCOXON TEST

Groups	Times	Mean	SD	Mean Diff	SD Diff	Effect Size	z-value	p-value
Group A	Pre	148.59	6.99	55.90	4.94	11.32	5.618	0.001
	Post	92.68	6.09					
Group B	Pre	141.78	7.97	50.85	5.91	8.61	5.598	0.001
	Post	90.93	3.95					
Group C	Pre	147.66	7.21	54.73	5.34	10.24	5.614	0.001
	Post	92.93	6.47					

The mean value in group - A indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 11.32 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - B indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 8.61 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - C indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 10.24 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention



GRAPH:4 MEAN VALUE OF BP 1 IN GROUP A,B AND C

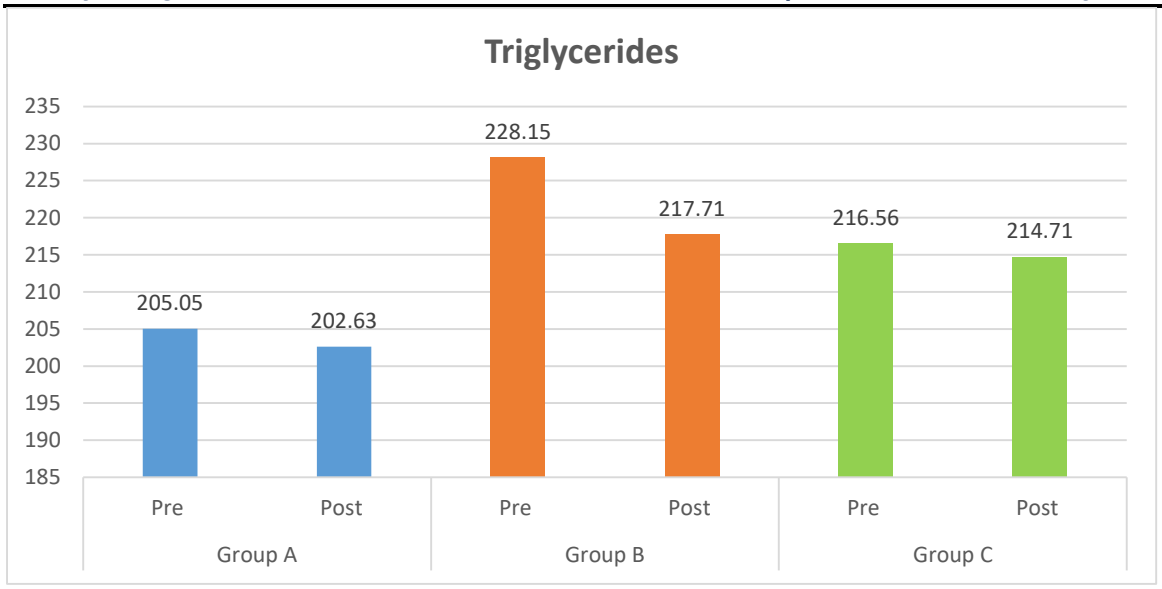
TABLE:9WITHIN GROUP COMPARISON OF THREE STUDY GROUPS WITH RESPECT TO TRIGLYCERIDES USING PAIRED SAMPLE T TEST

Groups	Times	Mean	SD	Mean Diff	SD Diff	Effect Size	z-value	p-value
Group A	Pre	205.05	39.09	2.41	1.94	1.25	5.122	0.001*
	Post	202.63	39.08					
Group B	Pre	228.15	48.78	10.44	1.98	5.28	5.611	0.001*
	Post	217.71	49.06					
Group C	Pre	216.56	63.28	1.85	0.99	1.87	5.615	0.001*
	Post	214.71	63.10					

The mean value in group - A indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 1.25 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - B indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the limited consistency with post treatment value which is more than pre value. The effect size or Cohen's D indicates 5.28 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

The mean value in group - C indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen's D indicates 1.87 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention

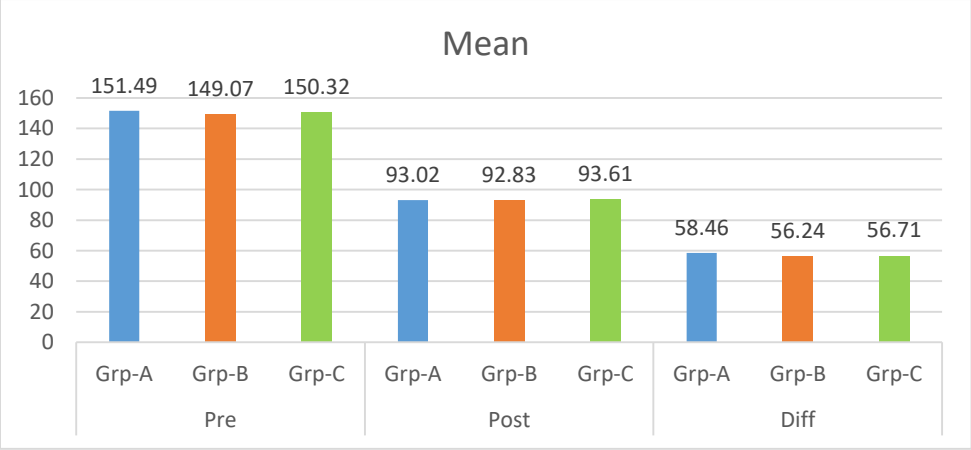


GRAPH:5 TRIGLYCERIDES

TABLE:10.BETWEEN GROUPS COMPARISON OF BP 1 BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

Time	Group	Mean	SD	z-value	p-value
Pre	Grp-A	151.49	7.12	1.684	0.431
	Grp-B	149.07	5.78		
	Grp-C	150.32	7.08		
Post	Grp-A	93.02	6.42	5.005	0.082
	Grp-B	92.83	4.10		
	Grp-C	93.61	6.59		
Difference	Grp-A	58.46	5.62	4.300	0.116
	Grp-B	56.24	6.00		
	Grp-C	56.71	5.48		

From the above table it is observed that between groups analysis is non-significant for pre time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups. From the above table it is observed that between groups analysis is non-significant for post time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups. From the above table it is observed that between groups analysis is non-significant for difference time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups



GRAPH:6 BETWEEN GROUPS COMPARISON OF BP 1 BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

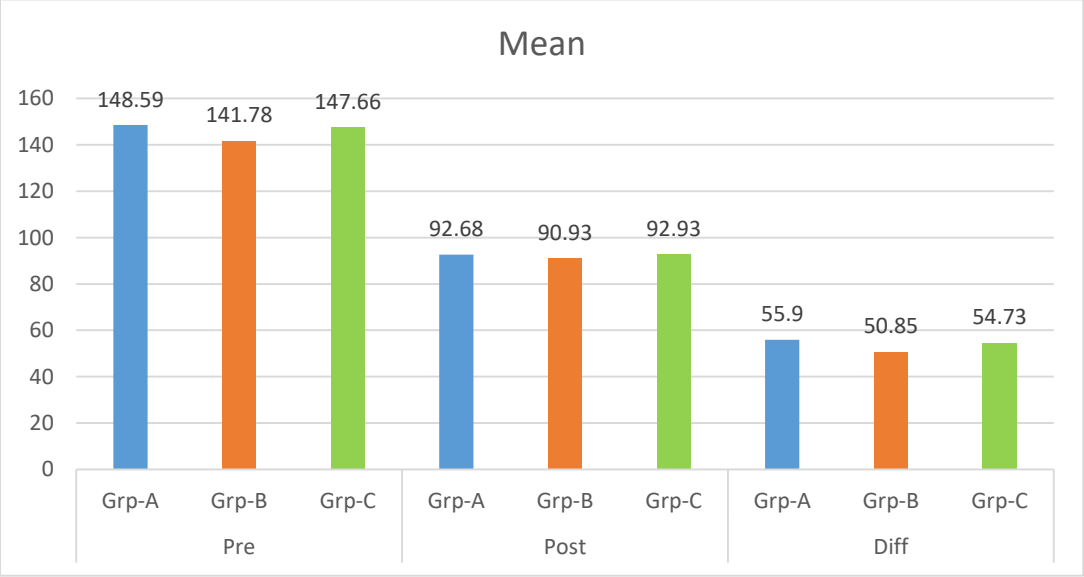
TABLE:11 PAIR WISE COMPARISON OF GROUPS BY MULTIPLE COMPARISON PROCEDURES POST HOC

Pair wise comparison of groups by multiple comparison procedures post Hoc			
Comparison	Pre	Post	Difference
Group A **Vs** Group B	p = 0.235	p = 0.987	p = 0.187
Group A **Vs** Group C	p = 0.708	p = 0.892	p = 0.347
Group B **Vs** Group C	p = 0.678	p = 0.816	p = 0.928
Results	Based on lower mean value, Grp-B is better	Based on lower mean value, Grp-B is better	Based on lower mean value, Grp-B is better

TABLE:12BETWEEN GROUPS COMPARISON OF BP 2 BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

Time	Group	Mean	SD	z-value	p-value
Pre	Grp-A	148.59	6.99	**10.041**	**0.007**
	Grp-B	141.78	7.97		
	Grp-C	147.66	7.21		
Post	Grp-A	92.68	6.09	**10.356**	**0.006**
	Grp-B	90.93	3.95		
	Grp-C	92.93	6.47		
Difference	Grp-A	55.90	4.94	**17.180**	**0.001**
	Grp-B	50.85	5.91		
	Grp-C	54.73	5.34		

From the above table it is observed that between groups analysis is significant for pre time frame at 5% level significance as the p-value is less than 5%. It shows significant differences between the groups. From the above table it is observed that between groups analysis is significant for post time frame at 5% level significance as the p-value is less than 5%. It shows significant differences between the groups. From the above table it is observed that between groups analysis is significant for difference time frame at 5% level significance as the p-value is less than 5%. It shows significant differences between the groups



GRAPH 7:MEAN OF BETWEEN GROUPS COMPARISON OF BP 2 BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

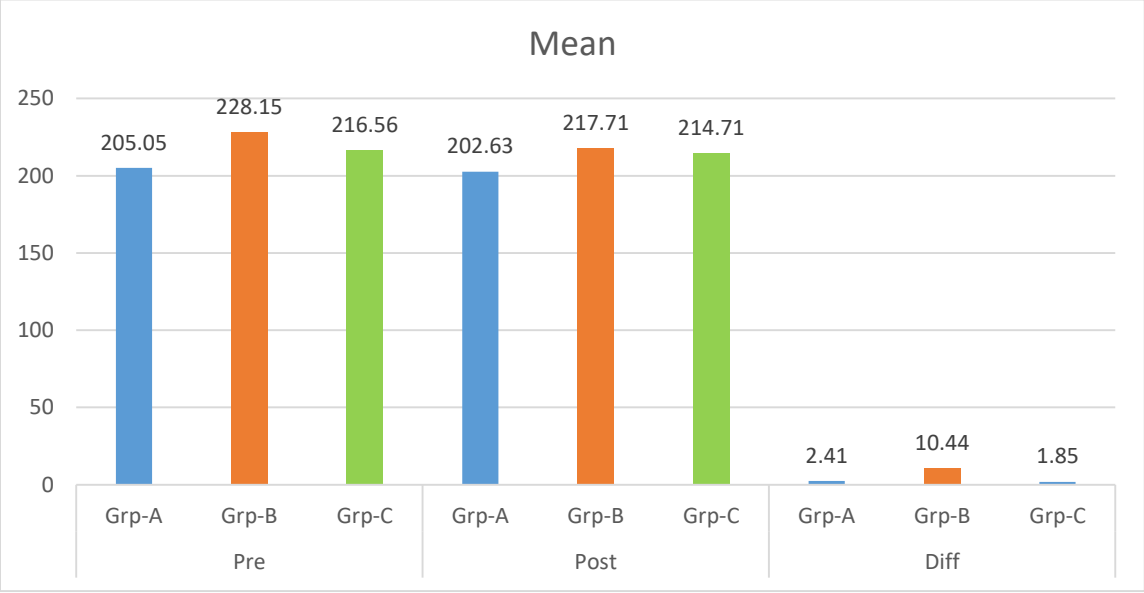
TABLE 13: PAIR WISE COMPARISON OF GROUPS BY MULTIPLE COMPARISON PROCEDURES ANOVA POST HOC

Pair wise comparison of groups by multiple comparison procedures ANOVA post Hoc			
Comparison	Pre	Post	Difference
Group A **Vs** Group B	p = 0.001*	p = 0.336	p = 0.001*
Group A **Vs** Group C	p = 0.838	p = 0.979	p = 0.591
Group B **Vs** Group C	p = 0.001*	p = 0.244	p = 0.004*
Results	Based on lower mean value, Grp-B is better	Based on lower mean value, Grp-B is better	Based on lower mean value, Grp-B is better

TABLE:14 BETWEEN GROUPS COMPARISON OF Triglycerides BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

Time	Group	Mean	SD	z-value	p-value
Pre	Grp-A	205.05	39.09	4.988	0.083
	Grp-B	228.15	48.78		
	Grp-C	216.56	63.28		
Post	Grp-A	202.63	39.08	2.070	0.355
	Grp-B	217.71	49.06		
	Grp-C	214.71	63.10		
Difference	Grp-A	2.41	1.94	**88.234**	**0.001**
	Grp-B	10.44	1.98		
	Grp-C	1.85	0.99		

From the above table it is observed that between groups analysis is non-significant for pre time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups. From the above table it is observed that between groups analysis is non-significant for post time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups. From the above table it is observed that between groups analysis is significant for difference time frame at 5% level significance as the p-value is less than 5%. It shows significant differences between the groups



GRAPH 8 : MEAN PFBETWEEN GROUPS COMPARISON OF Triglycerides BY Kruskal Wallis FOR PRE, POST AND DIFFERENCE VALUES

TABLE 15: PAIR WISE COMPARISON OF GROUPS BY MULTIPLE COMPARISON PROCEDURES POST HOC

Pair wise comparison of groups by multiple comparison procedures post Hoc			
Comparison	Pre	Post	Difference
Group A **Vs** Group B	p = 0.108	p = 0.382	p = 0.001*
Group A **Vs** Group C	p = 0.569	p = 0.569	p = 0.296
Group B **Vs** Group C	p = 0.565	p = 0.565	p = 0.001*
Results	Based on higher mean value, Grp-B is better	Based on higher mean value, Grp-B is better	Based on higher mean value, Grp-B is better

DISCUSSION

The purpose of this study is to compare the effect of aerobic exercise versus macqueen progressive resisted exercise versus patient on medication along with conventional exercises in blood pressure and triglyceride values in subjects with hypertension.

Total 123 patients with essential hypertension were divided into 3 groups equally, group A treated with aerobic exercises along with breathing exercises, group B Macqueen progressive resisted exercises along with breathing exercises, Group C treated with breathing exercise along with medications, Age group were selected based on inclusion and exclusion criteria.

Outcome measures were blood pressure (SBP/DBP) and triglycerides value. All groups were equally divided for finding inter and intra group comparision of scores of outcome measures one way Wilcoxon test and t paired test was used.

The result shows significant improvement in each group but group B i.e Macqueen progressive resisted exercise showed more significant effect than group A and C

The statistical analysis of the study shows that all three interventions were effective in lowering Blood pressure and triglyceride values in patients individually.

All groups are statistically significant i.e p value less than 0.05 or lower but group B shows more improvement post treatment.

JA.Hallbert 1997 conducted a study in subjects with high blood pressure, aerobic exercise lowers blood pressure. It will lessen adrenaline, which will inhibit sympathetic nervous system activity. Additionally, it will lower the level of angiotensin II in the blood, which lowers peripheral vascular resistance and raises the sensitivity of baroreceptors. A blood pressure-lowering exercise regimen and physical activities are optimal. One of the main risk factors for cardiovascular disease is hypertension. Exercises that involve slow breathing and aerobics are important in lowering blood pressure and enhancing exercise tolerance.

Reducing anxiety, blood pressure, and stress can all be achieved by slow breathing. Exercises involving slow breathing promote respiratory and cardiovascular health by reducing sympathetic activity. It will lessen chemoreflex activation and raise baroreflex sensitivity. Consequently, it will lower a person's heart rate, systolic, and diastolic blood pressure in hypertensive individuals.

An exercise program that is progressive in nature lowers the diastolic and systolic blood pressure during rest. However, the morbidity and mortality from cardiovascular diseases may not be significantly reduced by such a minor reduction. It has been demonstrated that little reductions like these have led to a lower risk of coronary heart disease and stroke. More significantly, though, it doesn't seem that progressive resistive activity increases blood pressure at rest.

A breathing exercise known as "slow breathing training" involves doing seven to eight cycles per minute while raising the respiratory amplitude and lowering the respiratory rate. The vagus nerve and baroreceptors are

stimulated by an increase in tidal volume. It blocks the outflow of the sympathetic nervous system and stops the effects of the parasympathetic nervous system by sending impulses to the vasomotor center. It lowers peripheral vascular resistance and tends to lower blood pressure through cardiac output.

Lokesh R 1 , S G Sudhan2 et.al studied the effects of resistive training programs on hypertensives and found that these programs, along with slow, controlled breathing exercises, can help maintain a healthy lifestyle. These methods assist those with hypertension in leading drug-free lives. Using Macqueen's method of progressive resisted exercise and breathing control training, a 4-week study was conducted comparing 20 hypertension sufferers (10 in each group). Ten patients received treatment using Macqueen's progressive resisted exercise technique, and an additional ten received breathing control instruction in addition to the exercise regimen. The patients' diastolic and systolic blood pressures were recorded before and after exercise. research on the impact of resistance training regimens on hypertensives discovered that these regimens, in conjunction with deliberate, slow breathing exercises, can support the maintenance of a healthy lifestyle. These techniques support drug-free living for people with hypertension. Twenty hypertension patients were compared over the course of four weeks using Macqueen's progressive resistive exercise and breathing control training method (10 in each group). In addition to the exercise schedule, ten patients received instruction in breathing control from Macqueen, who developed the progressive resisted exercise technique. Before and after exercise, the diastolic and systolic blood pressures of the individuals were measured. The result paints a vivid picture of the significant reduction in blood pressure while at rest. Therefore, we may conclude that Macqueen's moderate resistive exercise and breathing control training are both effective ways to lower blood pressure.

George A. Kelley and Kristi Sharpe investigated the relationship between resting blood pressure and progressive resistive exercise. The aim of this study was to investigate the effects of progressive resistance training on adult humans' resting systolic and diastolic blood pressure using a meta-analytic approach. It was determined that adults' resting systolic and diastolic blood pressure can be effectively decreased with increasing resistance training. Nevertheless, before the efficacy of progressive resistance exercise as a nonpharmacological intervention can be established, more research that restricts enrolment to hypertension participants and intention-to-treat data analysis are required.

From the statistics we have seen that group B i.e Maqueen progressive resisted exercises comparatively showed more effect than other two groups i.e Group A and GroupC.

CONCLUSION

This study highlights the comparing effect of aerobic exercises versus macqueens progressive resisted exercises versus patients on medications along with conventional exercises on blood pressure and triglycerides values in subjects with hypertension.

This study concluded that from the statistics we have seen that group B i.e Maqueen progressive resisted exercises comparatively showed more effect than other two groups i.e Group A and Group C.

All the groups are statistically significant but more group B shows more improvement post treatment than Group A and Group C

Overall analysis shows Group B=Macqueen Progressive Resisted exercise is more effective in lowering Blood pressure and triglyceride values than Group=Aaerobic exercises and Group=C patients on medications along with conventional exercises

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13. The prevalence of hypertension among males at age 15 was 4.13%, and age 49 was 27.34%. The study found a positive correlation between age and hypertension prevalence, with females having a prevalence of 2.81% at 15 and 30.09% at 49 and males having a prevalence of 4.13 at 15 and 27.34% at 49. Several studies confirm that hypertension increases with age [26][27][28]. It may be due to arterial stiffening, increased vascular resistance, lifestyle factors, and hormonal changes.

14. The pathophysiology of hypertension includes endothelial dysfunction and vascular remodeling (Ferreira et al., 2012;Hern andez et al., 1999;Liao et al., 1999). Ultimately, hypertension leads to target-organs damage (Mancia et al., 2013) and impaired skeletal muscle function (Ferreira et al., 2011;Hern andez et al., 1999). Hypertension is also associated with deterioration of functional capacity to perform daily living activities (Hajjar et al., 2007).

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16. Since plasma lipids are in a dynamic equilibrium with membrane lipids, the altered membrane lipid composition with resulting changes in membrane microviscosity might be the common factor underlying abnormal transmembrane cationic transport in dyslipidemia (Corrocher et al. 1987; Duhm et al. 1993 ;Lijnen

et al. 1994), hypertension (Corrocher et al. 1992), and diabetes (Lijnen et al. 1993). It was demonstrated Engelmann et al. 1993) that the pattern of molecular species of phosphatidylcholine and phosphoethanolamine in the cell membrane is responsible for the activity of particular ion transporting systems in hyperlipidemia..

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19. The newly formed capillaries were probably pressured from the outside by the abundant extracellular matrix. Both occurrences might prevent proper lumen formation and capillaries maturation, leading to functional rarefaction and apoptosis [20,22]. This is also a possible explanation for the presence of necrotic capillaries with features of young vessels (i.e., high and hypertrophic endothelium).

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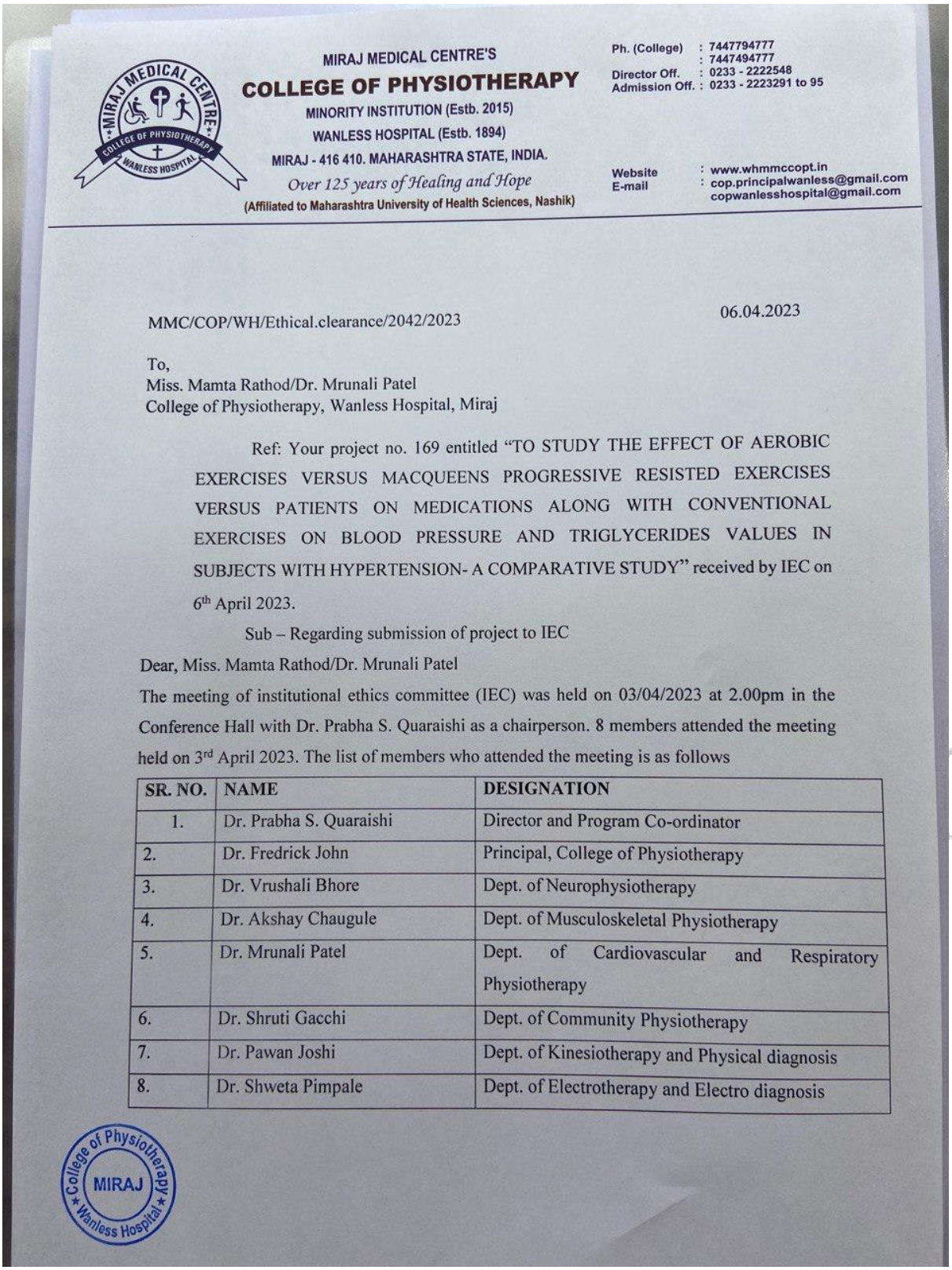
ANNEXURE I

ETHICAL CLEARANCE



MIRAJ MEDICAL CENTRE'S
COLLEGE OF PHYSIOTHERAPY
MINORITY INSTITUTION (Estb. 2015)
WANLESS HOSPITAL (Estb. 1894)
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Admission Off. : 0233 - 2223291 to 95
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E-mail : cop.principalwanless@gmail.com
copwanlesshospital@gmail.com

MMC/COP/WH/Ethical.clearance/2042/2023 06.04.2023

To,
Miss. Mamta Rathod/Dr. Mrunali Patel
College of Physiotherapy, Wanless Hospital, Miraj

Ref: Your project no. 169 entitled "TO STUDY THE EFFECT OF AEROBIC EXERCISES VERSUS MACQUEENS PROGRESSIVE RESISTED EXERCISES VERSUS PATIENTS ON MEDICATIONS ALONG WITH CONVENTIONAL EXERCISES ON BLOOD PRESSURE AND TRIGLYCERIDES VALUES IN SUBJECTS WITH HYPERTENSION- A COMPARATIVE STUDY" received by IEC on 6th April 2023.

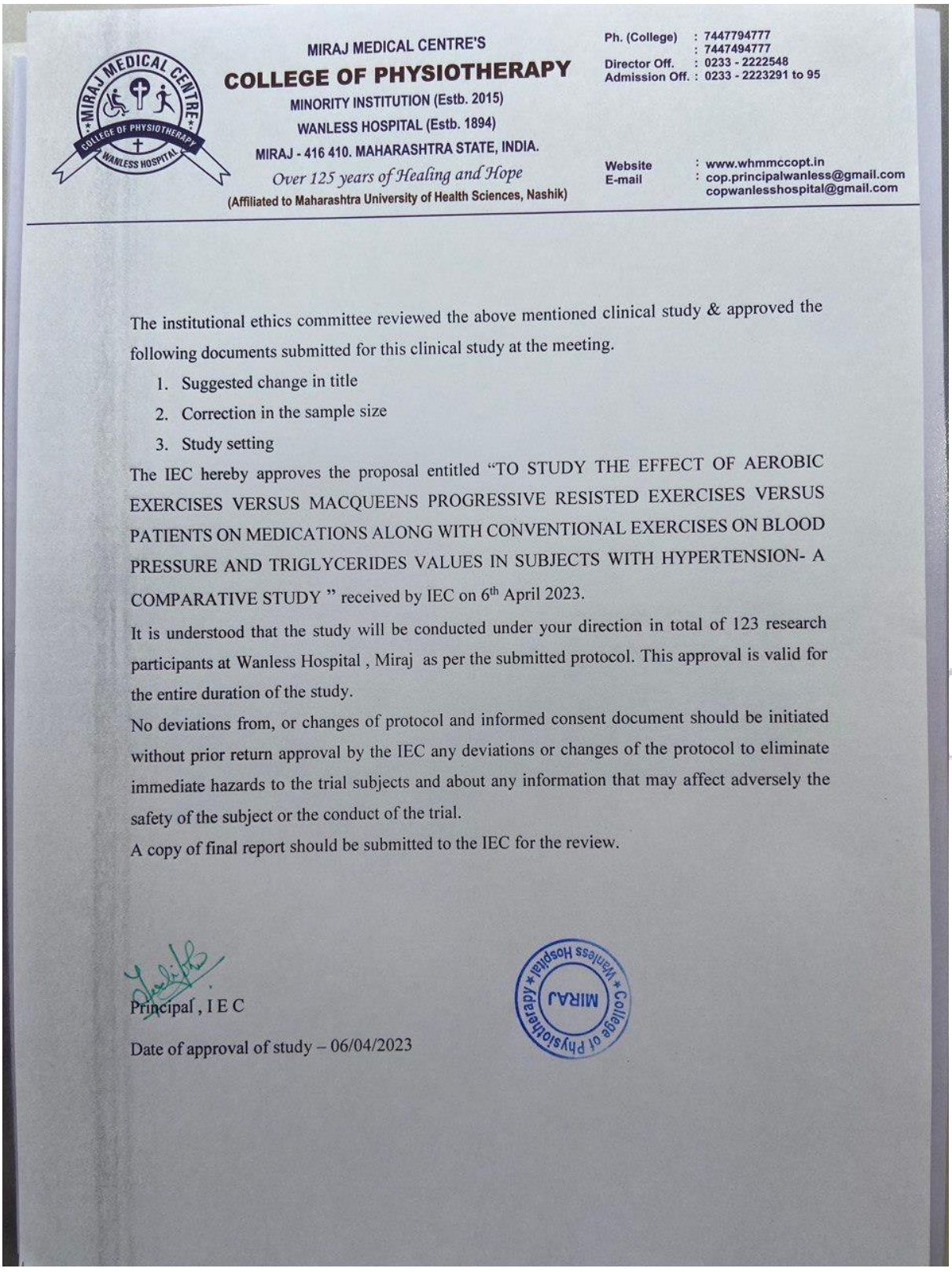
Sub – Regarding submission of project to IEC

Dear, Miss. Mamta Rathod/Dr. Mrunali Patel

The meeting of institutional ethics committee (IEC) was held on 03/04/2023 at 2.00pm in the Conference Hall with Dr. Prabha S. Quaraishi as a chairperson. 8 members attended the meeting held on 3rd April 2023. The list of members who attended the meeting is as follows

SR. NO.	NAME	DESIGNATION
1.	Dr. Prabha S. Quaraishi	Director and Program Co-ordinator
2.	Dr. Fredrick John	Principal, College of Physiotherapy
3.	Dr. Vrushali Bhore	Dept. of Neurophysiotherapy
4.	Dr. Akshay Chaugule	Dept. of Musculoskeletal Physiotherapy
5.	Dr. Mrunali Patel	Dept. of Cardiovascular and Respiratory Physiotherapy
6.	Dr. Shruti Gacchi	Dept. of Community Physiotherapy
7.	Dr. Pawan Joshi	Dept. of Kinesiotherapy and Physical diagnosis
8.	Dr. Shweta Pimpale	Dept. of Electrotherapy and Electro diagnosis

College of Physiotherapy MIRAJ Wanless Hospital



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E-mail : cop.principalwanless@gmail.com
copwanlesshospital@gmail.com

The institutional ethics committee reviewed the above mentioned clinical study & approved the following documents submitted for this clinical study at the meeting.

1. Suggested change in title
2. Correction in the sample size
3. Study setting

The IEC hereby approves the proposal entitled "TO STUDY THE EFFECT OF AEROBIC EXERCISES VERSUS MACQUEENS PROGRESSIVE RESISTED EXERCISES VERSUS PATIENTS ON MEDICATIONS ALONG WITH CONVENTIONAL EXERCISES ON BLOOD PRESSURE AND TRIGLYCERIDES VALUES IN SUBJECTS WITH HYPERTENSION- A COMPARATIVE STUDY " received by IEC on 6th April 2023.

It is understood that the study will be conducted under your direction in total of 123 research participants at Wanless Hospital , Miraj as per the submitted protocol. This approval is valid for the entire duration of the study.

No deviations from, or changes of protocol and informed consent document should be initiated without prior return approval by the IEC any deviations or changes of the protocol to eliminate immediate hazards to the trial subjects and about any information that may affect adversely the safety of the subject or the conduct of the trial.

A copy of final report should be submitted to the IEC for the review.

Principal , I E C

Date of approval of study – 06/04/2023

MIRAJ Wanless Hospital College of Physiotherapy

APPENDIX II

INFORMED CONSENT FORM

Participant's Name :

Age :

Gender :

Address :

Title of the project: Effect of Aerobic exercises versus Macqueen's progressive resisted exercises versus patient with medication along with conventional physiotherapy on blood pressure and triglycerides value in subjects with Hypertension

The details of the study have been provided to me in writing and explained to me in my own language. I confirmed that I have understood the above study and have the opportunity to ask question. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving any reasons. By doing so I am aware that my medical care or legal rights will not be affected. I agree that the data or results obtained from this study can be used only for scientific purpose(s). I fully agree to participate in the above study.

Signature of the participant: _____

Signature of the investigator: _____

Date:

Place:

परिशिष्ट 1

माहिती कन्सेंट फॉर्म

नाव :

वय:

लिंग:

पत्ता:

प्रकल्पाचे शीर्षक :"उच्च रक्तदाब असलेल्या व्यक्तींमध्ये रक्तदाब आणि ट्रायग्लिसेराइड्स मूल्यांवर पारंपारिक व्यायामासह औषधांवर एरोबिक व्यायाम विरुद्ध मॅकक्वीन्स पुरोगामी प्रतिरोधक व्यायाम विरुद्ध रूग्णांच्या प्रभावाचा अभ्यास करणे- एक तुलनात्मक अभ्यास".

वरील अभ्यासाचे तपशील मला लेखी दिले गेले आहेत आणि मला माझ्या स्वतःच्या भाषेत समजावून सांगितले आहे मी पुष्टी केली की मला वरील अभ्यास समजला आहे आणि मला प्रश्न विचारण्याची संधी आहे, मला हे समजले आहे की माझा माझ्या अभ्यासा मधील सहभाग ठीक आहे आणि मी कोणत्याही कारणाशिवाय काहीही मागे घेण्यास मोकळे आहे असे केल्याने मला माहित आहे की माझी वैद्यकीय सेवा किंवा कायदेशीर हक्क प्रभावित होणार नाहीत. मी सहमत आहे की या अभ्यासामधून प्राप्त केलेला डेटा किंवा परिणाम केवळ वैज्ञानिक हेतूंसाठी वापरल्या जाऊ शकतात, वरील अभ्यासात भाग घेण्यास मी पूर्णपणे सहमत आहे.

सहभागीची स्वाक्षरी :

चौकशी करत्याची सही :

APPENDIX III

DATA COLLECTION SHEET

Name of participants:

Age: Gender:

Occupation:

Address: BMI:

Duration of HTN:

Habits/ Addiction: Co-morbidities: Yes/ No

Any other disease/ Impairments :Yes/ No

Involved in any kind of physical activities: Yes/ No

Vitals:

BP: RR:

SPO2: PR:

Resistance:

Diet plan: Yes / No.

	PRE INTERVENTION SCORE	POST INTERVENTION SCORE
Blood pressure		
triglycerides		

Progression:

Signature of participants -

Signature of investigator –

Date: Place:

MASTER CHART

GROUP A: [AEROBIC EXERCIES]

Sr No.	Age	Gender	DU=HTN	Aerobic exercises				BMI	
				Blood pressure		Triglycerides			
				pre	post	pre	post		
1	31	Female	10 years	148/94	146/94	268	265	Ht-160	Wt-52=20
2	42	Male	10 years	160/100	158/98	184	182	Ht-172	Wt-72=24
3	44	Male	11 years	158/98	156/96	210	207	Ht-157	Wt-54=22
4	35	Female	9 years	146/94	144/92	216	213	Ht-156	Wt-50=18
5	39	Male	11years	146/94	144/92	175	172	Ht-163	Wt-60=18
6	45	Male	12 years	150/98	148/98	286	283	Ht-170	Wt-68=23
7	38	Female	10 years	148/94	146/94	192	190	Ht-157	Wt-54=22
8	40	Female	10 years	159/98	156/98	208	206	Ht-172	Wt-72=24
9	38	Male	11years	144/92	142/90	219	216	Ht-157	Wt-54=22
10	48	Male	12years	160/90	154/90	308	306	Ht-160	Wt-52=20
11	43	Male	7 years	148/94	146/94	260	258	Ht-167	Wt-59=21
12	33	Female	6 years	159/98	156/98	172	170	Ht-157	Wt-59=23
13	30	Female	5 years	140/80	138/80	188	186	Ht-157	Wt-54=22
14	37	Male	6 years	160/100	158/100	180	187	Ht-160	Wt-52=20
15	30	Male	5 years	150/98	148/98	158	154	Ht-170	Wt-68=23
16	38	Male	9 years	158/98	156/98	165	162	Ht-157	Wt-54=22
17	48	Male	11 Years	146/96	142/96	200	198	Ht-160	Wt-52=20
18	32	Female	8 years	160/90	154/90	164	160	Ht-163	Wt-50=18
19	42	Male	10 years	146/94	144/92	219	216	Ht-167	Wt-59=21
20	49	Male	11 Years	158/98	156/96	190	188	Ht-172	Wt-72=24
21	50	Female	12 years	158/98	156/98	179	178	Ht-167	Wt-59=21
22	35	Female	8 years	146/96	142/96	174	170	Ht-172	Wt-72=24
23	48	Male	9 years	148/94	146/94	188	180	Ht-157	Wt-54=22
24	48	Female	10 years	158/98	156/98	240	238	Ht-167	Wt-59=21
25	48	Female	10 years	142/80	140/82	207	204	Ht-165	Wt-54=20
26	41	Male	12 years	140/80	138/82	188	186	Ht-167	Wt-59=21
27	45	Female	11 Years	160/90	154/90	200	199	Ht-157	Wt-59=23
28	45	Male	11 Years	148/84	142/84	164	160	Ht-157	Wt-54=22
29	38	Male	8 years	158/98	156/98	280	278	Ht-160	Wt-52=20
30	32	Female	7 years	146/96	142/96	234	230	Ht-170	Wt-68=23
31	30	Female	8 years	160/90	154/90	160	157	Ht-157	Wt-54=22
32	42	Male	10 years	146/94	144/92	279	276	Ht-160	Wt-52=20
33	40	Female	10 years	158/98	156/96	143	142	Ht-163	Wt-50=18
34	43	Female	12 years	150/90	140/90	240	238	Ht-167	Wt-59=21
35	37	Female	9 years	142/80	140/80	184	182	Ht-172	Wt-72=24
36	47	Female	13 years	140/80	138/80	190	186	Ht-167	Wt-59=21
37	31	Female	9 years	142/80	140/80	217	214	Ht-157	Wt-54=22
38	48	Female	10 years	160/100	158/100	162	160	Ht-160	Wt-52=20
39	40	Female	10 years	148/94	146/94	192	190	Ht-170	Wt-68=23
40	42	Male	11 Years	159/98	156/98	208	207	Ht-157	Wt-54=22
41	31	Female	31 years	158/98	156/98	216	214	Ht-163	Wt-50=18

GROUP B: [MACQUEEN'S PROGRESSIVE RESISTED EXERCISE]

Age	Gender	DU=HTN	Macqueens exercise				BMI	
			Blood pressure		Triglycerides			
			pre	post	pre	post		
34	Female	8 years	148/92	143/92	198	188	Ht-162	Wt-56=21
38	Male	9 years	146/94	144/92	250	241	Ht-170	Wt-68=23
45	Male	10 years	150/94	142/92	298	287	Ht-165	Wt-61=22
45	Female	11 years	158/94	150/92	239	228	Ht-162	Wt-52=19
31	Female	10 years	148/98	142/94	217	206	Ht-162	Wt-54=20
48	Male	11 Years	160/96	150/90	228	218	Ht-167	Wt-65=23
40	Male	10 years	148/92	143/92	274	265	Ht-175	Wt-75=24
43	female	10 years	146/94	144/92	258	247	Ht-165	Wt-54=20
38	Female	10 years	142/92	138/90	287	277	Ht-160	Wt-54=21
50	Male	10 years	160/100	150/96	199	187	Ht-165	Wt-61=22
43	Female	9 years	148/98	140/92	210	199	Ht-160	Wt-56=22
30	Male	9 years	146/94	140/90	118	100	Ht-162	Wt-52=19
48	Male	12 years	142/86	120/80	191	180	Ht-157	Wt-54=22
50	Male	11 Years	148/92	143/92	180	168	Ht-160	Wt-52=20
49	Male	8 years	150/94	142/92	208	199	Ht-163	Wt-50=18
45	Male	12 years	146/94	144/92	270	260	Ht-167	Wt-59=21
45	Male	11 Years	158/94	150/92	239	229	Ht-172	Wt-72=24
39	Female	8 years	156/100	150/98	160	150	Ht-157	Wt-54=22
38	Male	7 years	148/96	142/94	188	180	Ht-165	Wt-54=20
50	Male	12 years	140/84	120/82	310	300	Ht-163	Wt-50=18
49	Female	8 years	158/94	150/92	189	182	Ht-167	Wt-59=21
50	Female	10 years	160/84	150/84	242	230	Ht-165	Wt-54=20
47	Male	9 years	146/94	144/92	221	210	Ht-167	Wt-59=21
49	Female	9 years	148/92	143/92	180	170	Ht-157	Wt-59=23
40	Male	11 Years	148/96	142/94	180	165	Ht-157	Wt-54=22
50	Male	10 years	146/94	144/92	278	265	Ht-160	Wt-52=20
48	Male	13 years	150/94	142/92	189	176	Ht-170	Wt-68=23
40	Female	9 years	142/92	140/90	178	170	Ht-157	Wt-54=22
38	Male	8 years	146/94	144/92	210	199	Ht-160	Wt-52=20
35	Male	7 years	160/84	150/84	236	226	Ht-163	Wt-50=18
42	Male	10 years	144/90	140/90	194	186	Ht-167	Wt-59=21
35	Male	9 years	154/94	146/94	209	200	Ht-172	Wt-72=24
41	Female	10 years	146/94	144/92	298	287	Ht-167	Wt-59=21
32	Female	8 years	140/84	120/82	221	212	Ht-167	Wt-59=21
44	Male	9 years	150/94	142/92	310	300	Ht-172	Wt-72=24
30	Female	8 years	148/92	143/92	342	331	Ht-157	Wt-54=22
48	Male	12 years	154/94	146/94	199	191	Ht-167	Wt-59=21
50	Male	13 years	148/96	142/94	176	168	Ht-165	Wt-54=20
49	Male	10 years	140/84	120/82	210	200	Ht-157	Wt-54=22
50	Female	11 Years	146/94	142/94	294	284	Ht-160	Wt-52=20

GROUP C: [BREATHING EXERCISE AND PATIENTS ON MEDICATIONS]

Sr No.	Age	Gender	DU=HTN	Patients on medications				BMI	
				Blood pressure		Triglycerides			
				pre	post	pre	post		
83	48	Male	12 years	146/96	142/96	229	227	Ht-160	Wt-52=20
84	32	Male	8 years	142/96	140/94	270	269	Ht-167	Wt-59=21
85	40	Female	10 years	148/96	146/96	197	195	Ht-170	Wt-68=23
86	42	Female	11 Years	160/100	158/98	268	266	Ht-172	Wt-72=24
87	39	Male	8 years	144/82	142/80	280	278	Ht-162	Wt-61=23
88	48	Male	11 Years	150/100	148/98	161	160	Ht-165	Wt-56=20
89	43	Female	10 years	146/94	142/92	180	177	Ht-167	Wt-54=23
90	45	Female	12 years	159/98	156/98	249	247	Ht-160	Wt-54=20
91	41	Male	10 years	144/92	142/92	198	196	Ht-160	Wt-54=19
92	38	Male	9 years	142/96	140/94	170	169	Ht-167	Wt-59=21
93	45	Male	12 years	148/96	140/92	108	108	Ht-165	Wt-52=19
94	40	Male	9 years	148/94	146/94	200	199	Ht-157	Wt-54=22
95	46	Male	13 years	159/98	156/98	368	366	Ht-160	Wt-52=20
96	50	Female	10 years	142/82	140/82	213	211	Ht-163	Wt-50=18
97	47	Female	7 years	146/94	144/92	219	213	Ht-167	Wt-59=21
98	50	Male	11 Years	158/98	156/96	153	152	Ht-172	Wt-72=24
99	42	Male	9 years	158/98	156/98	111	109	Ht-157	Wt-54=22
100	49	Male	11 Years	146/96	142/96	230	228	Ht-165	Wt-54=20
101	47	Male	10 years	148/94	146/94	374	372	Ht-163	Wt-50=18
102	50	Female	11 Years	146/94	144/92	149	148	Ht-167	Wt-59=21
103	50	Male	9 years	160/100	158/98	156	155	Ht-165	Wt-54=20
104	50	Male	10 years	140/80	138/80	198	197	Ht-167	Wt-59=21
105	50	Male	11 Years	142/80	140/80	278	276	Ht-157	Wt-59=23
106	45	Female	10 years	160/100	158/100	308	306	Ht-157	Wt-54=22
107	45	Female	9 years	148/94	146/94	201	200	Ht-160	Wt-52=20
108	45	Female	8 years	159/98	156/98	199	198	Ht-170	Wt-68=23
109	49	Female	9 years	140/80	138/80	258	256	Ht-157	Wt-54=22
110	35	Female	7 years	160/100	158/100	100	98	Ht-160	Wt-52=20
111	40	Male	10 years	150/98	148/98	278	275	Ht-163	Wt-50=18
112	44	Female	10 years	158/98	156/98	199	197	Ht-167	Wt-59=21
113	40	Female	8 years	146/96	142/96	263	260	Ht-172	Wt-72=24
114	33	Male	9 years	160/90	154/90	271	270	Ht-167	Wt-59=21
115	30	Female	7 years	146/94	144/92	312	310	Ht-172	Wt-72=24
116	41	Male	9 years	158/98	156/96	240	239	Ht-157	Wt-54=22
117	38	Male	9 years	158/98	156/98	165	162	Ht-167	Wt-59=21
118	50	Male	10 years	142/80	140/80	184	182	Ht-165	Wt-54=20
119	32	Female	9 years	160/100	158/100	167	165	Ht-167	Wt-59=21
120	43	Male	11 Years	144/82	142/82	200	199	Ht-157	Wt-59=23
121	49	Male	12 years	148/84	142/84	234	231	Ht-157	Wt-54=22
122	35	Female	9 years	158/98	156/98	154	151	Ht-160	Wt-52=20
123	39	Female	9 years	146/96	142/96	187	186	Ht-170	Wt-68=23