بسم الله الرحمن الرحيم


وما أوتيتم من العلم إلا قليلا

BRACHIAL ARTERY ADAPTATION TO HANDGRIP TRAINING EXERCISE IN PATIENTS WITH TYPE 2DIABETES

BY
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تكيف شريان الذراع لتمرين قبضة اليد لمرضى السكرى من النوع الثانى

Acknowledgement

- *First and above all, all thanks and gratitude to **Allah** the most merciful, the most compassionate, without His help, I couldn't have finished this work.*
- *I wish to express my deepest respect to **Prof. Dr. Zahra Mohamed Serry**, Assistant Professor of Physical Therapy for Cardiovascular/Respiratory Disorder and Geriatrics, Faculty of Physical Therapy, Cairo University, for her continuous encouragement, never ending support and sincere advice, which have been the main factors to complete this work.*

- *I am greatly thankful to **Prof. Dr. Emam abdel-latif Waked** professor of internal medicine for his continuous support, encouragement and advices to accomplish this work. He closely followed the preparation and conduction till finishing this work.*
- *I am deeply and greatly thankful to **Prof. Dr. Nesreen Ghareeb El-Nahas**, assistant professor of physical therapy for cardiovascular/respiratory disorder and geriatrics, faculty of physical therapy, Cairo University for her valuable supervision, continuous support, constructive criticism, encouragement and helpful advices to accomplish this work.*

- *Special thanks to my parents and all my family for their continuous help and support.*
- *Special thanks to all my colleagues in physical therapy department in El-Agouza Police Authority Hospital for their continuous help and support, and deep thanks to all patients who participated in this study.*

INTRODUCTION

- Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. **(American Diabetes Association., 2014).**

Persons with type 2 diabetes mellitus are at significantly increased risk of atherosclerotic cardiovascular disease (CVD) presenting as coronary heart disease, stroke and peripheral vascular disease. For these persons, their vascular age far exceeds their chronological age, significantly increasing their relative risk of CVD events. **(Stone etal., 2013)**

Statement of Problem:

- Did hand grip exercises affect brachial artery adaptation in patients with type 2 diabetes?

Purpose of Study:

- To find out the effect of hand grip exercises on brachial artery adaptation in patients with type 2 diabetes.

Significance of Study:

- Diabetes is one of these diseases having a high prevalence and consequently a substantial socio-economic burden in the Arab region. Six of the top 10 countries with the highest prevalence of diabetes (in adults aged 20 to 79 years) are in the Middle East: Kuwait (21.1%), Lebanon (20.2%), Qatar (20.2%), Saudi Arabia (20.0), Bahrain (19.9%) and UAE (19.2%) **(Boutayeb et al., 2013)**

Type 2 diabetes mellitus (T2DM) is one of chronic diseases that are associated with endothelial dysfunction which may contribute to limited glucose uptake in skeletal muscle. In fact, diabetes-related endothelial dysfunction has been reported to lead to morphologic and structural vascular changes present throughout the course of diabetes. **(Arce-Esquivel et al., 2011)**

Type 2 diabetes is a significant cause of premature mortality and morbidity related to cardiovascular disease (CVD), blindness, kidney and nerve disease, and amputation **(Colberg et al., 2010)**

Resistance and aerobic Exercise show beneficial effects on abnormal vascular structure and function (including endothelial dysfunction and vascular distensibility) associated with T2DM.Exercise training also, restores myocardial structure and performance, with increasing resistance to ischemia. **(Marwick et al., 2009)**

Regular exercise training program for 4weeks increases muscular activity improves arterial blood flow, diameter, peak velocity, and vascular conductance. **(Billinger et al., 2009)**.

Null Hypothesis:

- There would be an effect on brachial artery adaptation to hand grip exercise training in patients with type 2 diabetes

PATIENTS AND METHODS

- **I. Patients:**
- Forty patients of both sexes (20 men and 20 women) with age ranged from 45- 55 years. They had type 2 diabetes at least since 10 years. They were selected from EL- AGOUZA POLICE AUTHORITY HOSPITAL from out-patient clinic for internal medicine.
- Practical work was done in the period from April 2013 to June 2014

Inclusion Criteria:

- Patients age from 45 to 55 years.
- Patients with type2 diabetes with FBG level (129-134mg/dl).
- Patients with disease duration (10-15 years)
- Patients under medical control
- Patients with BMI between (31.53-36.39kg/m^2)

Exclusion Criteria:

- Patients with autonomic neuropathy.
- Patients with cardiovascular instability.
- Smokers.
- Patients on medication known to affect peripheral blood flow.
- Patients with nephropathy and diabetic retinopathy.
- Patients with active foot problems.

II. Equipments:

- **Evaluative Equipment:**
- Disposable plastic syringes to draw venous blood sample used to measure patient's fasting blood glucose level

Weight and Height scale to measure the weight to detect BMI.

•**Doppler ultrasonography** to assess brachial artery diameter, blood flow and shear rate.

- **Training Equipment:**

Jammar handgrip dynamometer

Treadmill for aerobic exercise training

III: Procedure:

- **Evaluation:** Measuring brachial artery diameter, blood flow and shear rate using Doppler Ultrasound

Formula to calculate shear rate:

$(4 \times V / D)$

where Vm is mean blood velocity (cm / s) and D is mean arterial diameter (cm)

B. Treatment Procedure:

The exercise recommendations for patients with T2DM :

- Patients should aim to accumulate a minimum of 210 min of moderate intensity or 125 min of vigorous intensity exercise each week.
- This total amount of exercise should consist of a combination of aerobic and resistance training.
- Aerobic and resistance training can be combined in the one session.
- Exercise should be performed on at least 3 days each week with no more than two consecutive days without training.
- The exercise recommendation can be achieved with a combination of moderate and vigorous intensity exercise

Group A:

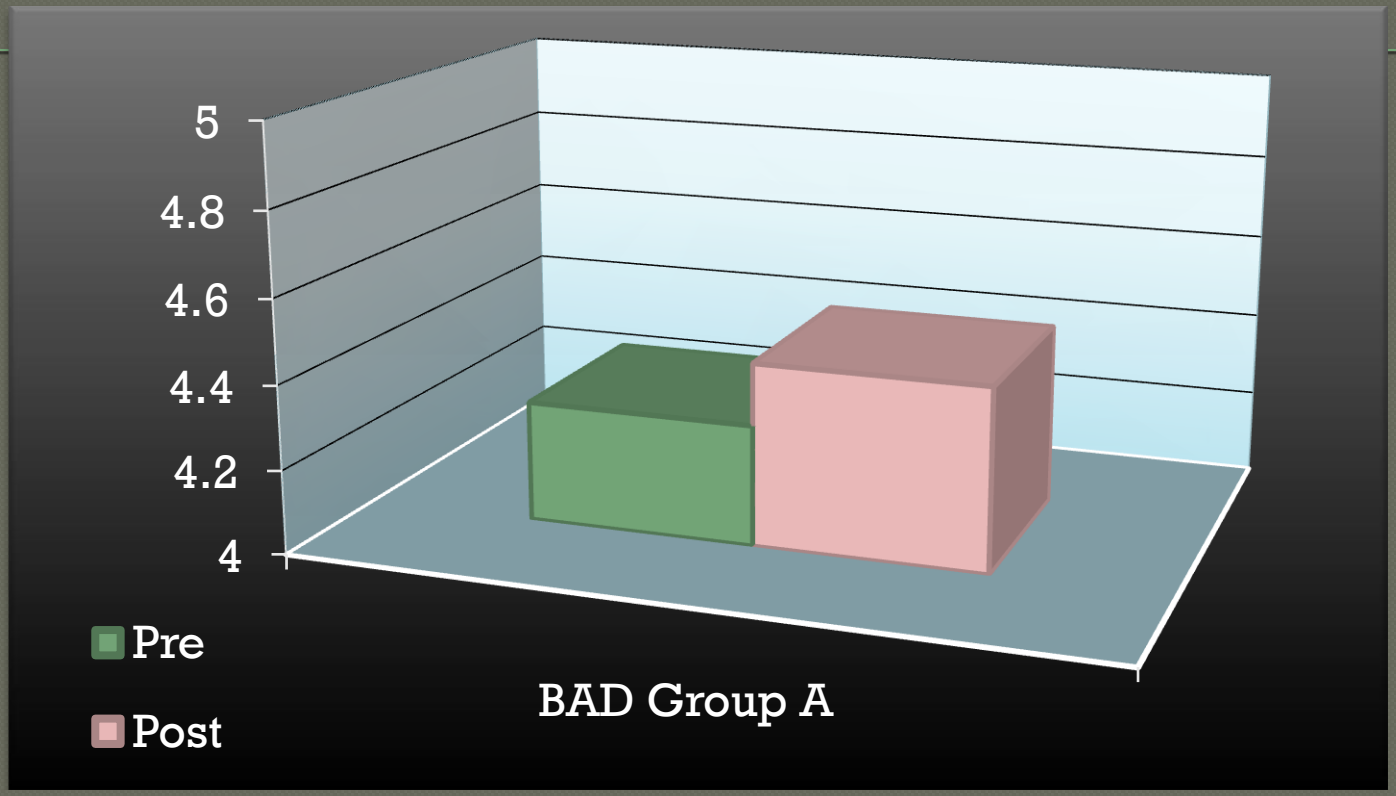
Patients performed four sets of 2-min isometric HG contractions (The contraction and relaxation time was set at 2 seconds each) using a programmed HG dynamometer three times per week for 8 weeks. Isometric contractions were performed at 30% maximal voluntary contraction, and each contraction was separated by a 2-min rest interval.

Group B:

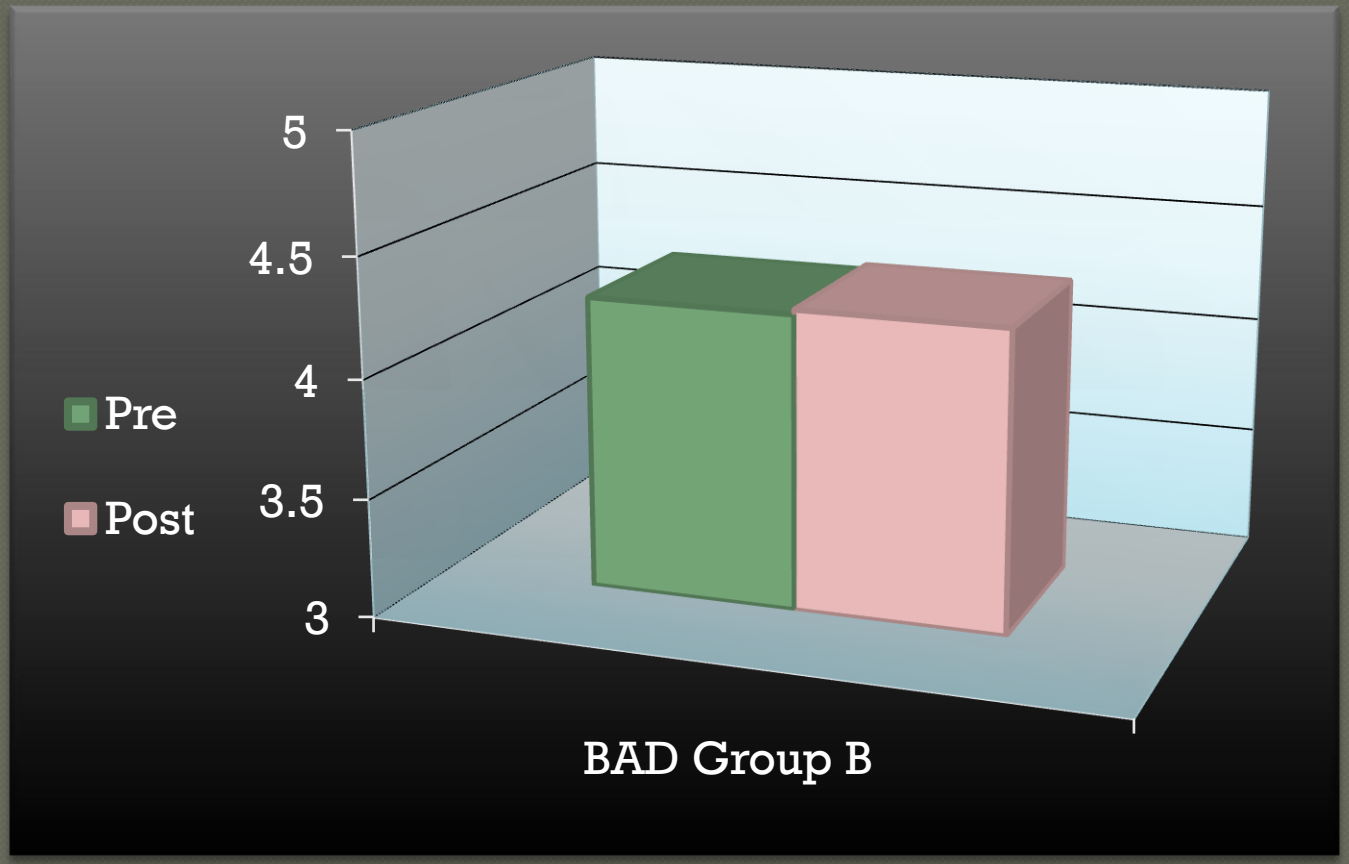
The aerobic training session was 30 min in duration and consisted of a 5min warm-up in form of stretching exercises, 20 min of aerobic training, at 65% of maximum heart rate(MHR) detected by a sensor in the hand rail of treadmill and 5 min of cool down in form of stretching exercises , three times per week for 8 weeks

To calculate the MHR:
For male : (220-age)
For females : (210- age)

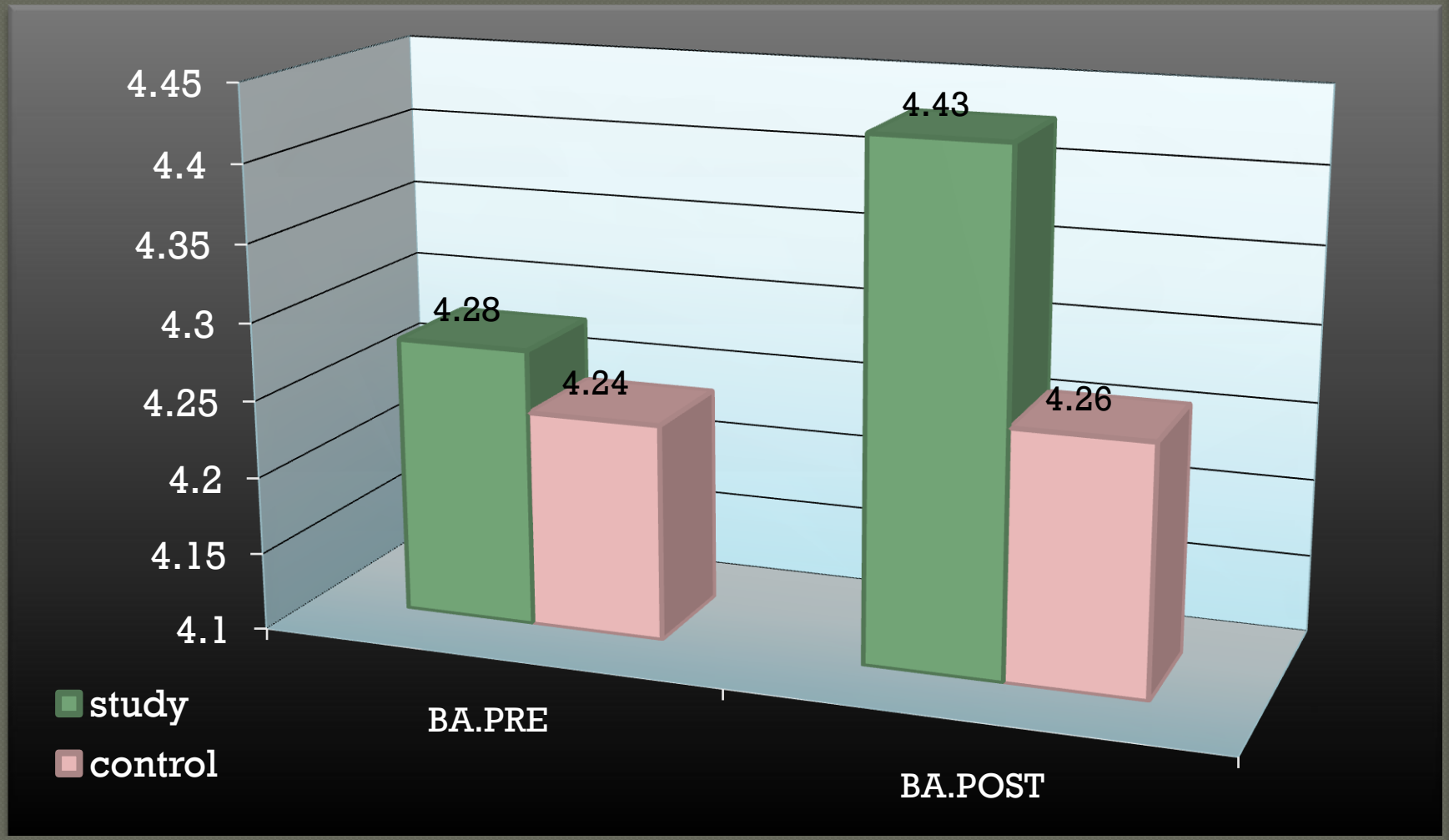
RESULTS



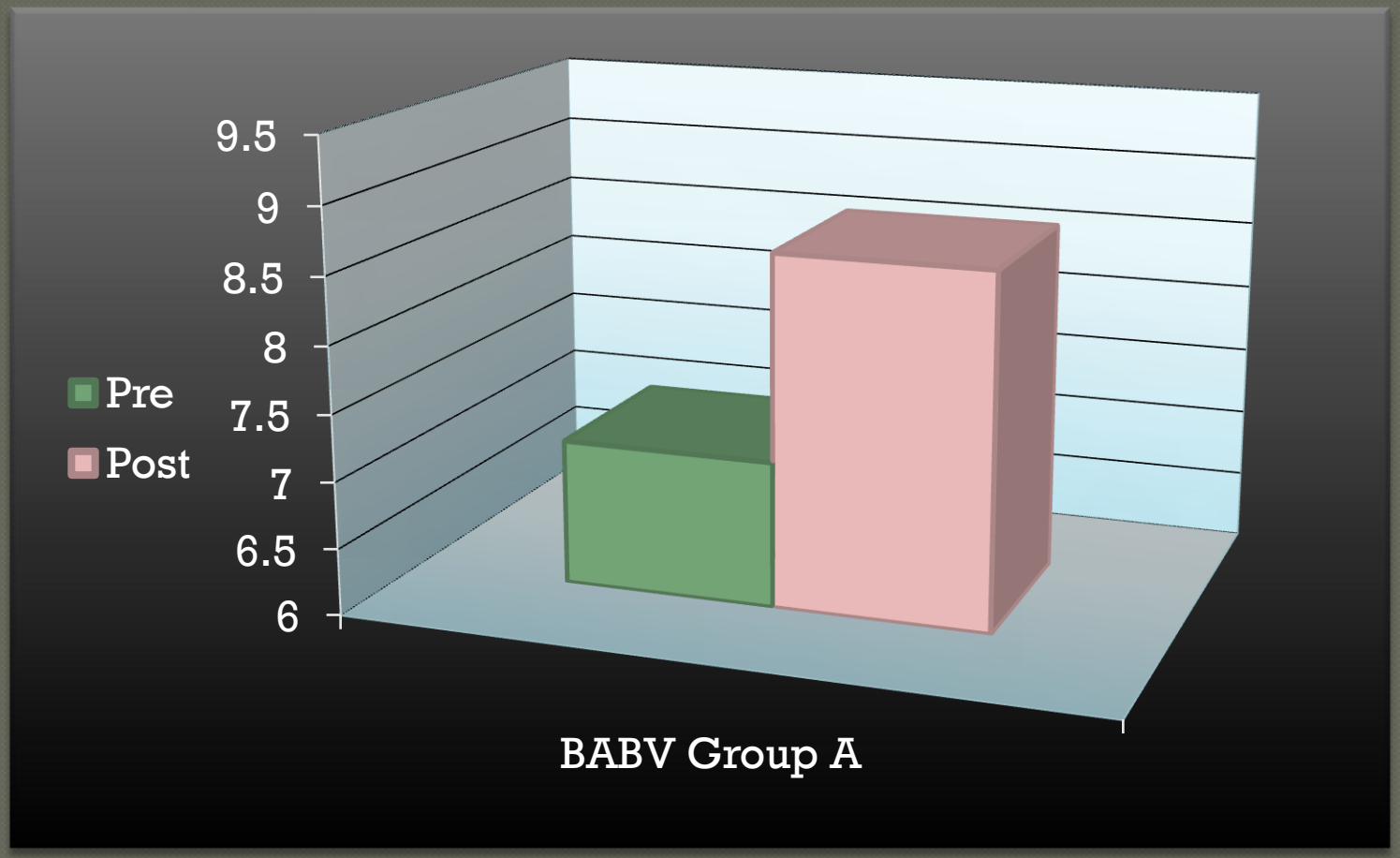
Mean of Brachial Artery Diameter Pre and Post Treatment for Group (A)



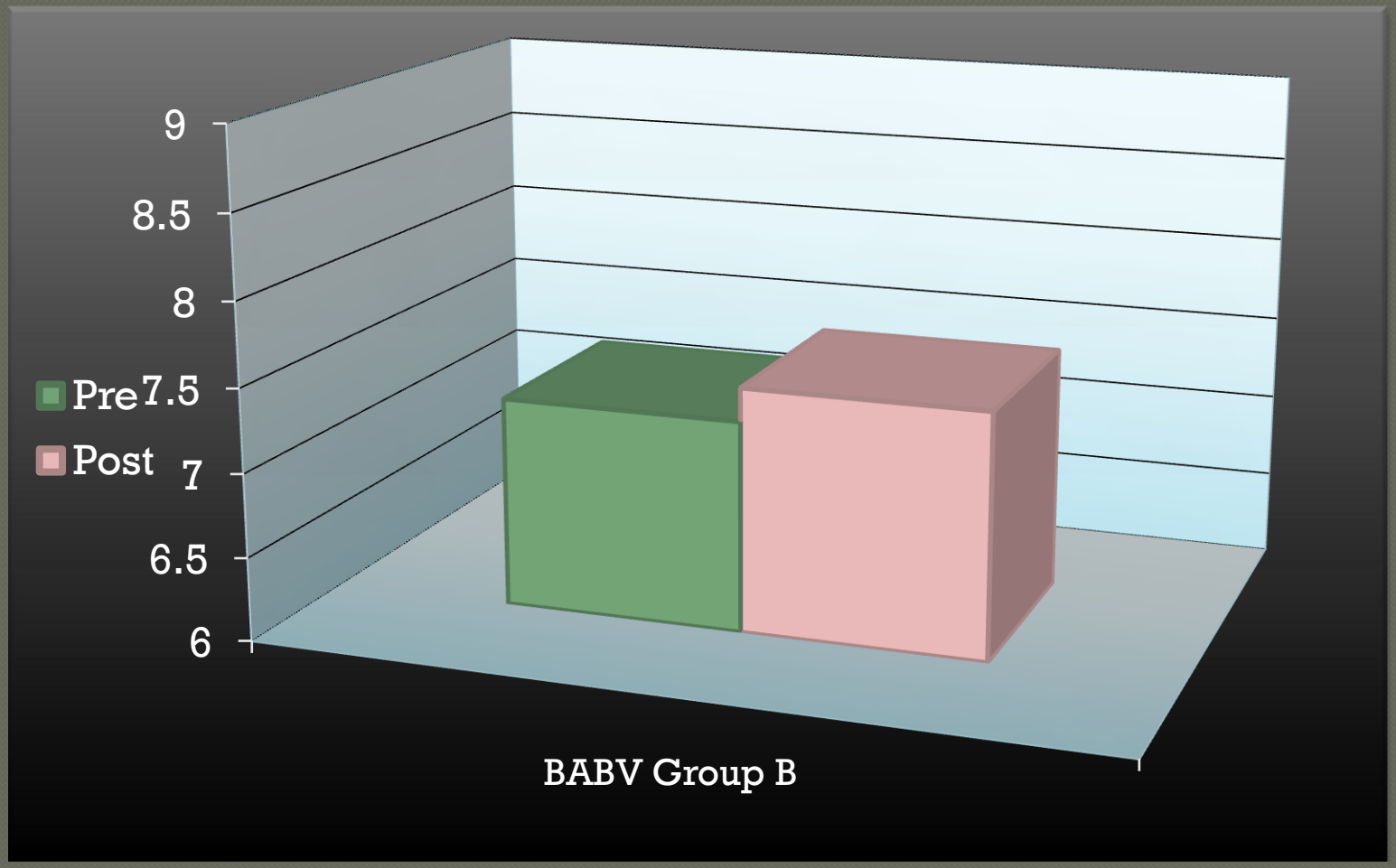
Mean of Brachial Artery Diameter Pre and Post Treatment for Group (B)



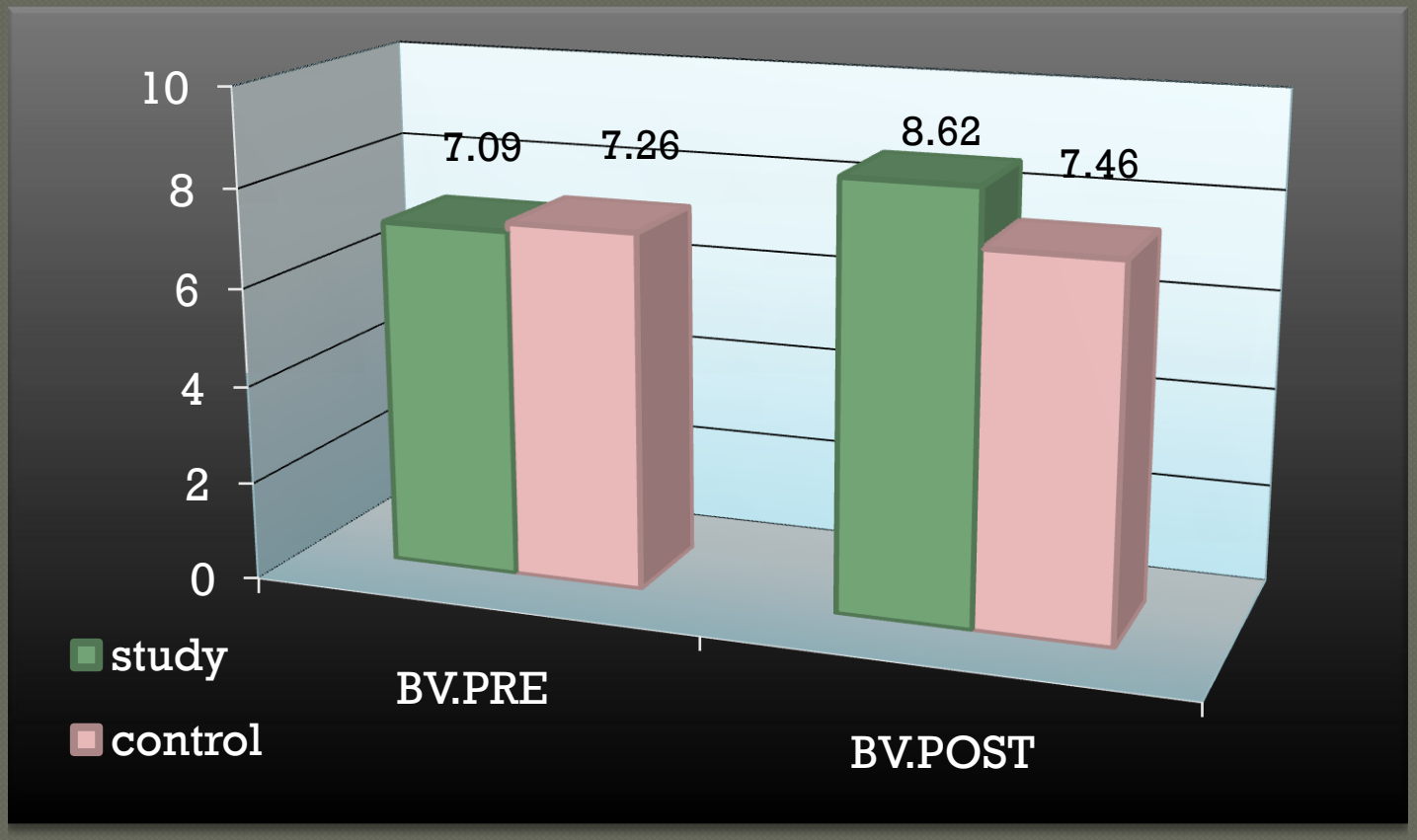
The mean brachial artery diameter pre and post treatment between groups



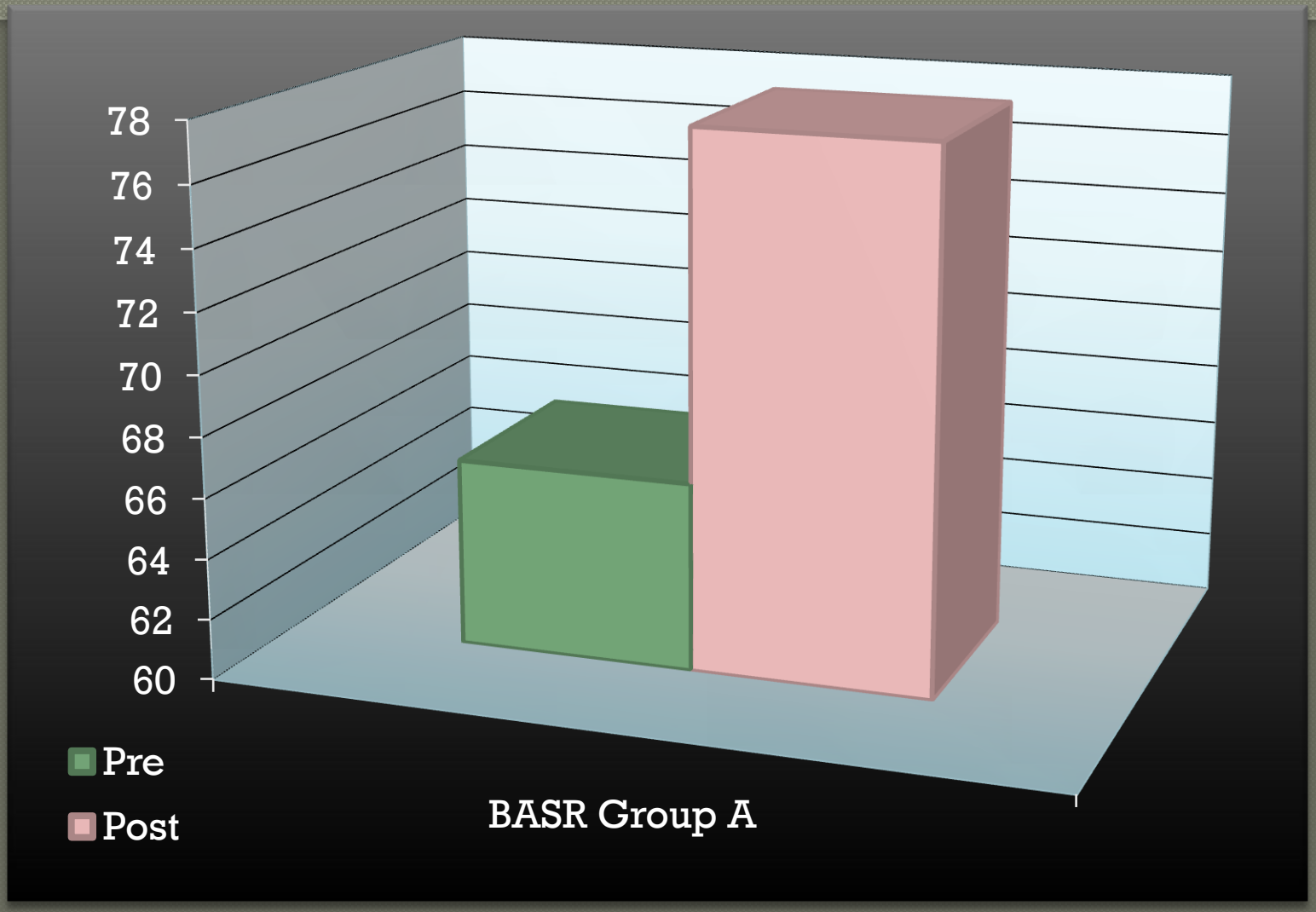
Mean of Brachial Artery Blood Velocity Pre and Post Treatment for Group (A).



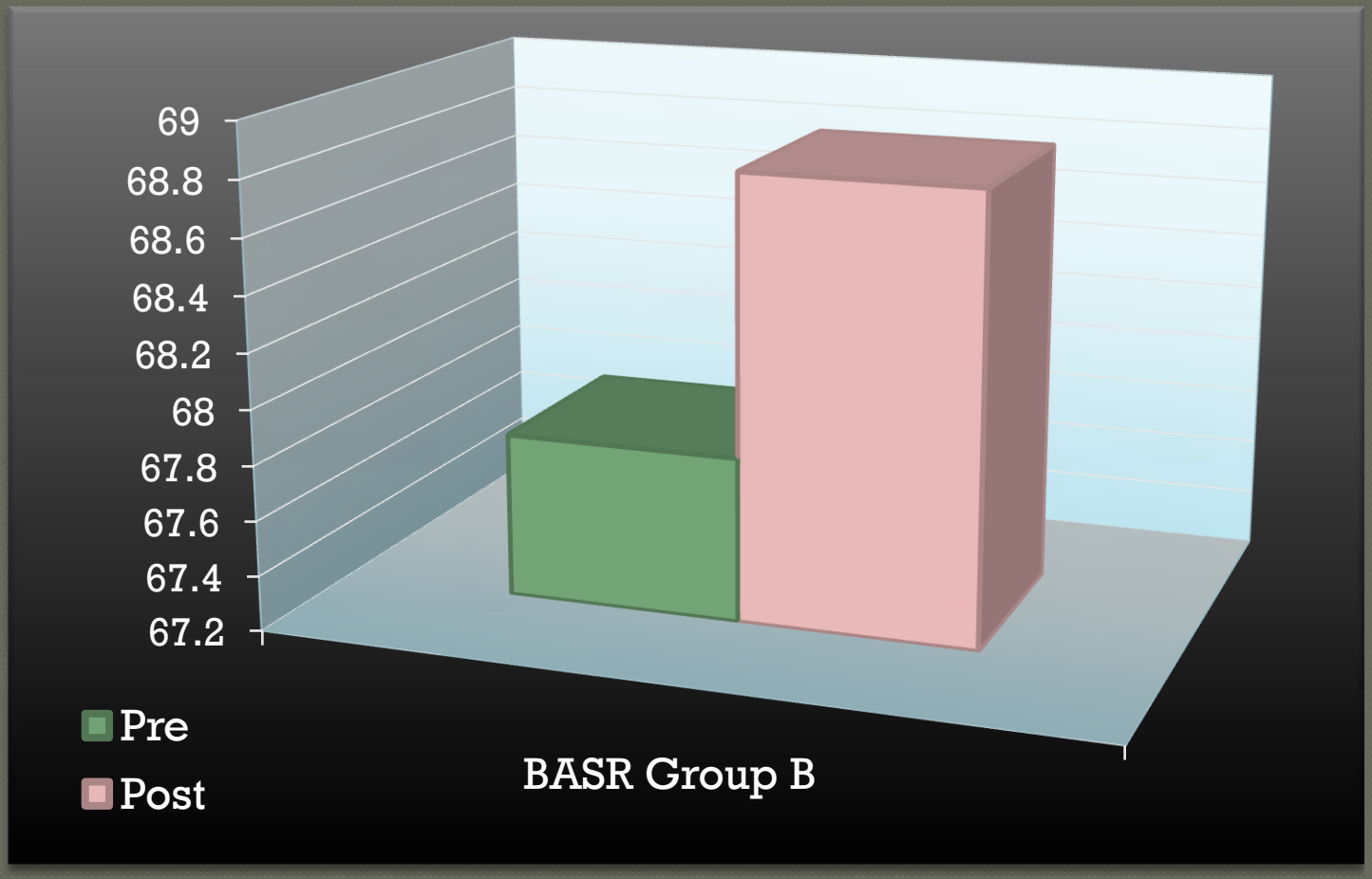
Mean of Brachial Artery Blood Velocity Pre and Post Treatment for Group (B).



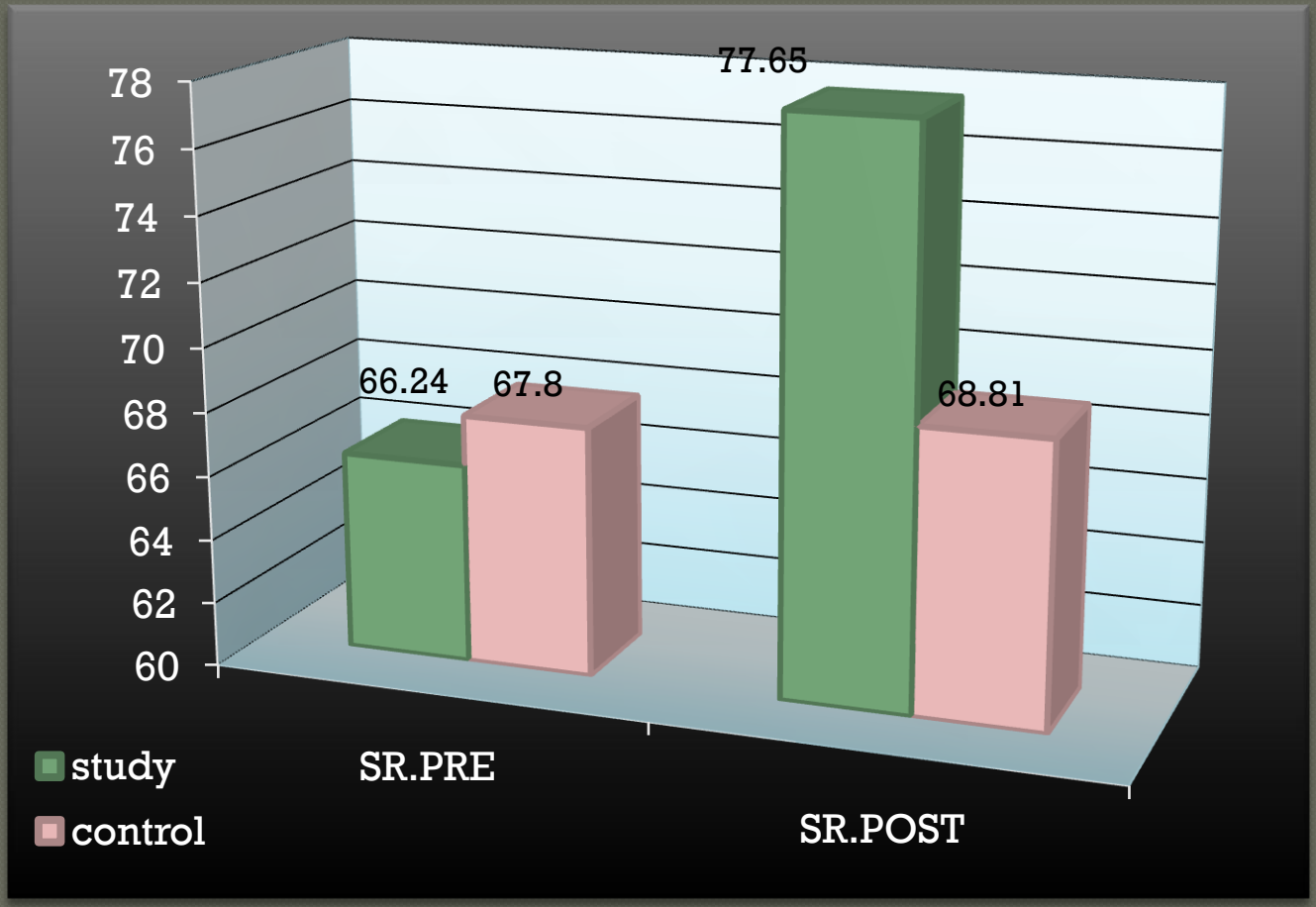
The mean brachial artery blood velocity pre and post treatment within groups



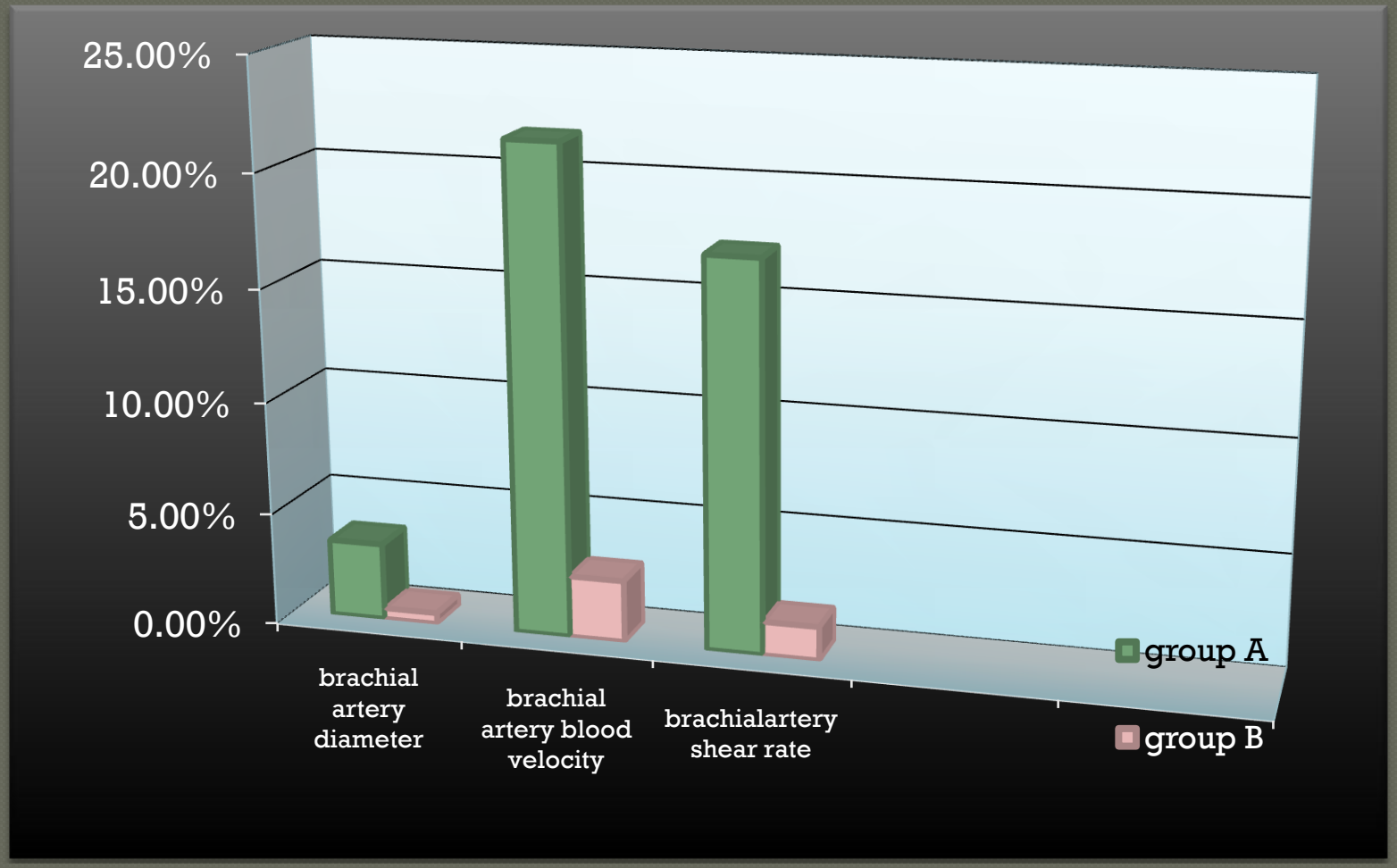
Mean of Brachial Artery Shear Rate Pre and Post Treatment for Group (A).



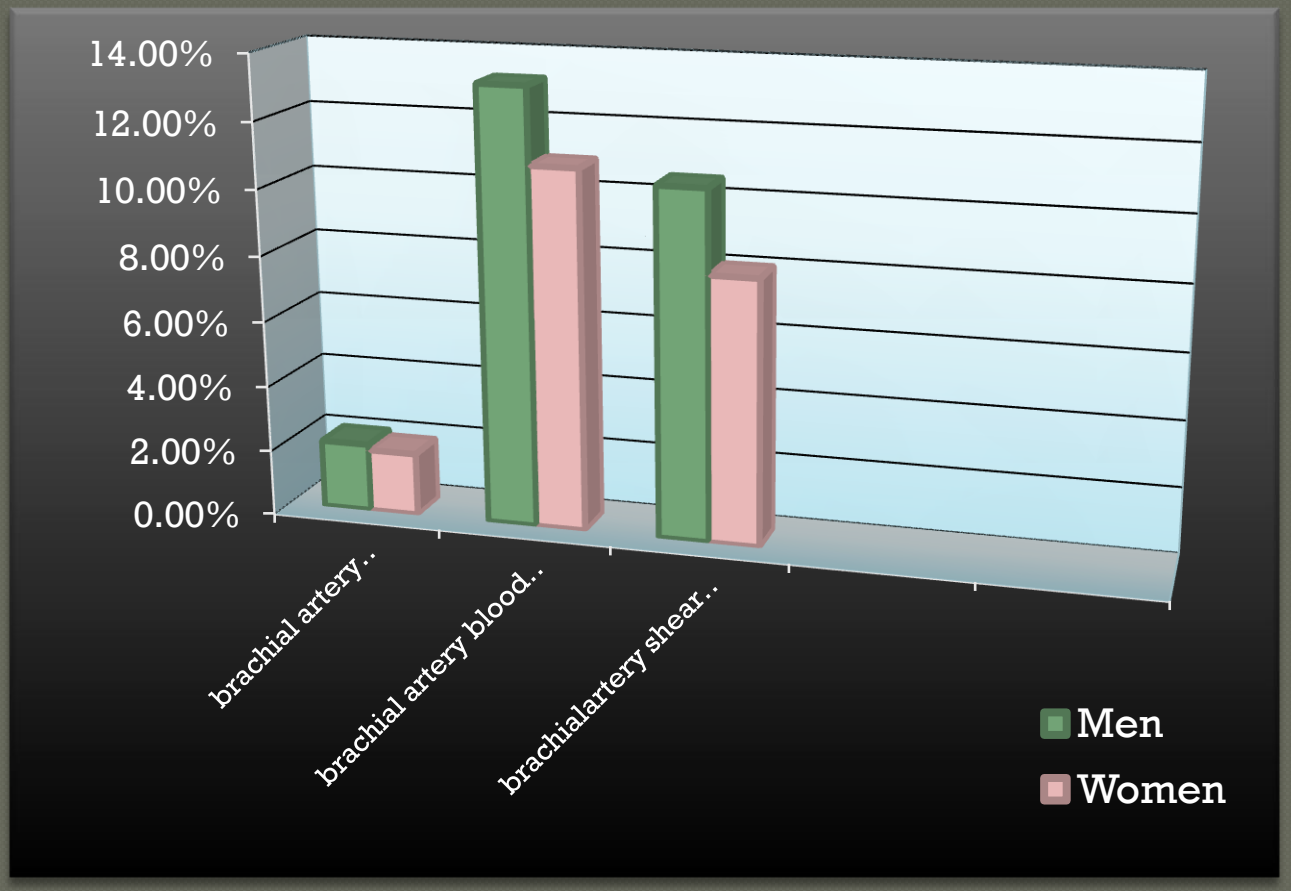
Mean of Brachial Artery Shear Rate Pre and Post Treatment for Group (B).



The mean brachial artery shear rate pre and post treatment within groups



Summary of percentage of change of both groups in brachial artery diameter, blood velocity and shear rate



Percentage of improvement between men and women of both groups

CONCLUSION

- It was concluded that:

  isometric hand grip exercise is fruitful and beneficial for brachial artery adaptation in patients with diabetes type 2

RECOMMENDATIONS

Seminars should be held in clinics of internal medicine to demonstrate the abstract of this study and to explain importance of exercise for arterial adaptation in patients with type 2 diabetes.

Posters for out-patients clinics to show the benefits of handgrip exercise on brachial adaptation

Thank you